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# Naval Ocean Research and Development Activity

August 1989

Report 210



## Environmental Measurements and Analysis: Arctic Acoustics Experiments in the Marginal Ice Zone

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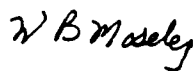
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## Foreword

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The Marginal Ice Zone (MIZ) along the east coast of Greenland is a strategic geographic region. Propagation of sound in this area is the least understood and most complex in the entire Arctic, both acoustically and oceanographically. The presence of the Polar Front associated with the East Greenland Current causes substantial temporal and geographic acoustic variability. In addition, combinations of ice cover, marginal ice, and open water present a complex range-dependent medium for propagation of sound at all but the very lowest frequencies. Comprehensive environmental measurements in the MIZ are invaluable for interpreting acoustic data. This report documents and provides a preliminary analysis of such a set of environmental measurements collected during April and May 1988 in support of an environmental acoustics exercise conducted by the Naval Ocean Research and Development Activity.



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## Executive Summary

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From 27 April through 28 May 1988, personnel of the Naval Ocean Research and Development Activity and other institutions utilized the USCGC *Northwind* to establish an ice camp to conduct an environmental acoustics exercise in the Marginal Ice Zone (MIZ) between Greenland and Svalbard in the Fram Strait. This report documents the comprehensive set of environmental data collected in support of the acoustic measurements. These data include expendable bathy-thermographs, conductivity-temperature-depth profiles, both vertical and time series current meter casts, meteorological and navigational measurements, and satellite imagery. In addition, this report provides a brief synopsis of the sequence of events that transpired during the exercise, a preliminary environmental analysis, and some suggestions for future MIZ experiments.

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## Acknowledgments

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This research was supported by the Office of Naval Technology with technical management provided by the Naval Ocean Research and Development Activity through Program Element 62435N, Dr. Dan J. Ramsdale, program manager.

The professionalism and cooperation of the officers and crew of the USCGC *Northwind* are greatly appreciated. Mr. Peter Becker, Applied Physics Laboratory/ University of Washington, provided floe orientation measurements. Satellite imagery was provided by Mr. Jeffrey Hawkins, NORDA Ocean Sensing and Prediction Division, and bathymetry plots were provided by Mr. Jay Egloff, NORDA Seafloor Geosciences Division.

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# Environmental Measurements and Analysis: Arctic Acoustics Experiments in the Marginal Ice Zone during May 1988

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## I. Introduction

The Marginal Ice Zone (MIZ) is an oceanographically and acoustically complex region. The presence of the Polar Front and associated large eddies can cause substantial changes in sound speed structure over relatively short distances. In addition, areas of complete ice cover, ice mixed with open water, and open water present a range-dependent fluctuating medium for propagation of sound, at both weapons and sonar detection frequencies. The Office of Naval Technology (ONT) sponsored and the Naval Ocean Research and Development Activity (NORDA) conducted environmental acoustics measurements in the MIZ at high and sonar frequencies off the northeast coast of Greenland, in the Fram Strait, from 27 April to 28 May 1988, from an ice camp supported by the USCGC *Northwind*. Other participants were the Arctic Submarine Laboratory, Naval Ocean Systems Center, San Diego, California; the Applied Physics Laboratory, University of Washington, Seattle, Washington; Ocean Sensors, Inc., Encinitas, California; the Navy Polar Oceanographic Center (NPOC), Suitland, Maryland; and Patrol Wing Five Detachment, NAS Keflavik, Iceland.

A comprehensive set of environmental data was collected to locate a suitable operating area for acoustic experiments and to define the physical oceanographic environment, which determines acoustic propagation characteristics during the experiment. A suitable operating area required the presence of a large, multiyear ice floe within 30 nmi of open water. Oceanographic data collected aboard the USCGC *Northwind*, from *Northwind*-based HH-52 helicopters, and from the ice camp include expendable bathythermographs (XBT), conductivity-temperature-depth (CTD) profiles, and both vertical and time series current meter casts. Navigational fixes and meteorological data collected at the ice camp include wind speed and direction, peak gusts, air temperature, barometric pressure, and solar radiation. In addition, Advanced Very High Resolution Radiometer (AVHRR) satellite imagery was collected to determine the extent of regional ice coverage during the exercise.

This report documents the environmental data collection and analysis in support of acoustic measurements.

## II. Synopsis of Events

### A. Initial Floe Location/Selection (28 April-1 May)

Satellite imagery, analyzed at NORDA prior to the *Northwind*'s departure from Reykjavik, Iceland, was used to identify the initial experimental location. These images and Marine Patrol Aircraft (MPA) sorties provided a first-order estimation of ice coverage in the exercise area. Images were also used by NPOC to produce tailored ice forecasts and provide initial ice floe selection for the exercise before departure from Reykjavik.

NORDA's Remote Sensing Branch, Ocean Sensing and Prediction Division, collected AVHRR imagery from the NOAA-9 polar-orbiting satellite during the exercise using their Satellite Data Receiving and Processing System. This 1-km resolution imagery is available for the days 1-4, 5, 8, 9, 11, and 12-19 May in both visible and infrared wavelengths (0.58 to 0.68 and 10 to 12  $\mu$ , respectively). Since near-visible wavelengths represent reflected energy from the ice and water surfaces, this band is useful in discriminating the ice/water interface. The 10-12  $\mu$  wavelength band senses emitted thermal energy, providing a limited ability to "remove" thin cloud cover during the enhancing process. Hence, near-visible and infrared images taken at the same time can assist in discerning ice/water features from cloud cover. All images will be examined for the amount of cloud cover present in the exercise area. Useful images will be processed into calibrated, earth-located polar stereographic projections specific to the exercise area. These data will be available on both magnetic tape and hard copy.

Figure 1 shows an (AVHRR) image of the Fram Strait taken during 17 May, the first day of the exercise. The position of the ice camp at 170801Z May 88 was 78°57.78'N, 1°23.02'W, which was very close to the ice

edge, as indicated in the satellite image. Judging from the numerous helicopter sorties taken from *Northwind* while in the ice, it was apparent that areas of "clear" water (especially between adjacent ice floes) contained smaller floes and thin ice of subpixel resolution.

During 28 April–8 May, four prearranged MPA sorties were flown by Patrol Wing Five Detachment, Keflavik, Iceland, to locate, tag, and track candidate ice floes for habitation and to provide a detailed description of the age of ice floes in specific geographical areas. Two NPOC personnel assisted in this effort, and provided continuity after *Northwind's* departure from Iceland to the MIZ. NPOC ice edge and pack descriptions, coupled with NORDA remote sensing imagery, indicated that the portion of the MIZ for which the acoustic exercise should be conducted existed at least 4° north of the originally planned location.

### B. Transit (2 May - 12 May)

After the second MPA sortie, *Northwind* commenced transit from Iceland north to the MIZ. Periodic messages were provided by NPOC with updates of ice edge location and probable areas of large habitable floes. Upon reaching the ice edge on 7 May, two helicopter sorties were launched to map a route to the inner MIZ and select a specific floe for habitation.

XBT data were collected during the icebreaker transit into and leaving the ice to assess positions of the water masses relative to the icebreaker/ice camp position.

### C. Floe Occupation (12 May - 21 May)

On 9 May, a floe with a multiyear ice area and an adjoining first-year refrozen lead was selected at 79°30.9'N, 1°05.9'W. Ice thickness on the multiyear floe was nominally 11 ft and the refrozen lead thickness was 3.5 ft. Most of the camp gear was offloaded the same day using two helicopters. The rest of the "hotel" equipment and electronics was offloaded by 10 May. Coast Guard assistance was generously provided for this and many other functions upon request. Concurrent with electronic equipment setup, acoustic array deployments commenced. Acoustical measurements were collected throughout 13–21 May. Personnel and equipment were backloaded to *Northwind* and personnel offloaded in Reykjavik, Iceland. Equipment was offloaded in Nova Scotia for shipment back to Mississippi.

## III. Oceanographic Measurements

### A. Background

The oceanographic environment in the MIZ off the eastern coast of Greenland is complex and highly

variable.<sup>1,2</sup> As shown in Figure 2, the circulation in the upper 500 m of the exercise area is dominated by the southward-flowing East Greenland Current, which circulates both Polar Water and below that, water of Atlantic origin termed Atlantic Intermediate Water (AIW). AIW composes the majority of the East Greenland Current transport, and is characterized by temperature and salinity ranges of 0° to 3°C and 34 to 35 ppt and by acoustic sound velocities >1445 m/s. It originates in the area of Fram Strait where northward-flowing Atlantic water entrained in the West Spitzbergen Current branches to the west, mixes with Polar Water, and returns southward as a subsurface water mass in the East Greenland Current. This water mass has a width of 100 km or less and is found at depths between 50 and 300 m.

Overriding AIW in the surface layer, the Polar Water is encountered. This water mass, which originates in the Arctic and flows through Fram Strait along the eastern coast of Greenland, is characterized by temperatures <0°C, salinities between 30 and 34 ppt, and acoustic sound speed <1445 m/s. A major oceanographic feature, the Polar Front, lies between the cold, low-salinity Polar Water and the warm, high-salinity Atlantic Water. This front is not a vertical wall, but rather slopes toward the west as a function of depth at a rate that is approximately a 1-m increase in depth per kilometer. Historically, the mean position of this front is located near the 1000-m depth contour and, like most fronts, is characterized by the appearance of fine structure—in this case caused by double-diffusion processes and interfingering of the two water masses. This frontal variability and the dissimilar water masses on either side of the Polar Front caused large temporal and spatial variability in the sound speed profile during the exercise. The bathymetry of the exercise area (Fig. 3) indicates the 1000-m depth contour. These data are from the NAVOCEANO DBDB 5 data base.

Extensive navigational and weather data were recorded both at the ice camp and aboard *Northwind*. Seven helicopter sorties were launched to collect CTD data to define the position of the East Greenland Polar Front and to define the oceanographic variability along the acoustic propagation paths. A total of 38 CTDs and 10 XBTs was collected in support of acoustic measurements. A continuous time series of 7 CTD casts was collected in support of the high-frequency events that took place from 19/1600Z May to 20/1200Z May. The time series current meter data taken at 99-m depth cover the entire acoustic data collection period. Two video camera filmstrips were taken along acoustic propagation paths from a helicopter at an altitude of 600 ft.

## B. Navigational Data

The raw satellite data recorded from the Si-Tex model A300S SATNAV receiver were rectified by examining data for unrealistic changes in speed between adjacent fixes. The great circle distance between each successive fix was computed and the corresponding floe velocity calculated. For example, when the calculated speed of advance for the floe exceeded 5 kt, the fix was deleted. The positional accuracy is given as  $\pm 0.05$  nmi under normal conditions. A map of the exercise area and ice camp positions is given in Figure 4. The floe relative rotation and rotation rate are shown in Figure 5 and tabulated in Table 1. The orientation was measured from a baseline at camp relative to the ship's gyrocompass heading on the *Northwind*. Since *Northwind* was located approximately 5 nmi away, these measurements are sparse due to poor visibility.

Table 1. Ice floe rotation measurements.

Date/Time	Angle (CW) (deg true)
5/12 15:00Z	0
5/13 15:00	2
5/14 15:00	2
5/15 15:00	2
5/16 15:00	2
5/17 07:37	61
5/18 12:13	22
5/19 09:00	69
5/19 11:00	43
5/20 11:20	29
5/20 21:00	103

## C. Surface Weather Data

Surface weather was recorded at the ice camp using an Enviro-Lab Model DL-120-CI-W weather logger. The sensor specifications are given in Table 2. Weather sensors were sampled every minute and averaged over 15-minute intervals. Averaged wind speeds and the peak speed sampled within that interval are shown in Figure 6 during the period of the acoustic exercise. Also shown is wind direction ( $^{\circ}$ T) corrected for floe orientation. Figure 7 contains the surface temperature, pressure, and incident solar energy sampled and averaged over the same 15-minute periods during the acoustic exercise.

## D. CTD Measurements

CTDs were taken aboard *Northwind*, from seven HH-52 helicopter sorties deployed from *Northwind* and from the ice camp. Casts 1-5 were taken with an ODEC model 302 system; casts 10A-19C were taken with a model OS100 CTD system developed by Ocean Sensors, Inc. The sensor specifications are given in Table 2. The calibration of the temperature sensor on the ODEC unit shifted inexplicably between calibration in March 1988 and use in May. The ODEC data were corrected by recalibrating the unit with the Ocean Sensors unit using data collected during a tandem cast (2,11A) and a saltwater ice bath. Table 3 lists the geographic locations of the CTD measurements, and the figure in Appendix D shows a map of CTD measurement

Table 2. Meteorological and CTD sensor specifications.

Meteorological Sensor Specifications	
<b>Wind Speed</b> Range: 0 to 50 m/s Resolution: 0.1 m/s Accuracy: $\pm 0.5$ m/s	<b>Air Temperature</b> Range: $-30$ to $+50^{\circ}\text{C}$ Resolution: $0.1^{\circ}\text{C}$ Accuracy: $\pm 1.0^{\circ}\text{C}$
<b>Wind Direction</b> Range: 0 to $359^{\circ}$ Resolution: $1.0^{\circ}$ Accuracy: $\pm 4.0^{\circ}$	<b>Barometric Pressure</b> Range: 75 to 95 kPa Resolution: 0.1 kPa Accuracy: $\pm 0.2$ kPa
ODEC CSTD Specifications	Ocean Systems CSTD Specifications
<b>Conductivity</b> Measurement Range: 0 to 65 mS/cm Accuracy: $\pm 0.01$ mS/cm	<b>Conductivity</b> Measurement Range: 0.1 to 70 mS/cm Accuracy: $\pm 0.1$ mS/cm
<b>Temperature</b> Measurement Range: $-2$ to $+30^{\circ}\text{C}$ Accuracy: $\pm 0.01^{\circ}\text{C}$	<b>Temperature</b> Measurement Range: $-2.0$ to $+30^{\circ}\text{C}$ Accuracy: $\pm 0.01^{\circ}\text{C}$
<b>Depth</b> Measurement Range: 0 to 1000 m Accuracy: $\pm 0.2\%$ full scale	<b>Depth</b> Measurement Range: 0 to 500 m Accuracy: $\pm 0.5$ m
<b>Salinity</b> Computed using Unesco 1978 equation Measurement Range: 0 to 40 ppt Accuracy: $\pm 0.03$ ppt	<b>Salinity</b> Computed using Unesco 1978 equation Measurement Range: 0 to 40 ppt Accuracy: $\pm 0.03$ psu



Table 3. XBT, CTD and current measurement locations.

Date	Latitude	Longitude	Time	Station	Probe	Platform
<b>CTD Stations</b>						
10 May	79°33.7N	0°54.9W	1615Z	1	ODEC	ship
11 May	79°32.6N	0°29.6W	0900	2,11A	ODEC, O	ship
12 May	79°27.5N	1°13.0E	0930	12B	OS	helo
12 May	79°13.5N	0°43.0E	1100	12C	OS	helo
12 May	79°10.7N	0°04.0E	1130	12D	OS	helo
12 May	79°21.0N	0°04.0W	1200	12E	OS	helo
12 May	79°25.7N	2°30.0W	1500	12F	OS	helo
12 May	79°28.2N	1°36.0W	2150	12G	OS	helo
13 May	79°22.4N	0°02.2E	1545	3	ODEC	camp
14 May	79°15.6N	0°12.7W	2330	4	ODEC	camp
15 May	79°08.8N	0°05.2E	2340	5	ODEC	camp
16 May	78°40.5N	2°38.0W	1930	16A	OS	helo
16 May	78°47.5N	2°04.0W	1951	16B	OS	helo
16 May	78°49.8N	1°24.0W	2016	16C	OS	helo
17 May	79°22.2N	2°51.0W	1443	17A	OS	helo
17 May	79°14.3N	2°37.0W	1503	17B	OS	helo
17 May	79°03.5N	1°48.0W	1533	17C	OS	helo
18 May	78°52.5N	2°08.3W	1000	18A	OS	ship
18 May	78°52.0N	2°16.0W	1030	18B	OS	ship
18 May	78°52.0N	2°20.0W	1730	18C	OS	ship
18 May	78°49.9N	2°22.6W	1830	18D	OS	ship
18 May	78°49.1N	2°26.0W	2120	18E	OS	ship
19 May	78°44.0N	2°56.0W	1104	19B	OS	ship
19 May	78°35.2N	3°32.1W	1838	19C	OS	ship
20 May	78°29.6N	3°56.4W	0138	20A	OS	camp
20 May	78°29.4N	3°57.2W	0252	20B	OS	camp
20 May	78°28.6N	4°02.9W	0428	20C	OS	camp
20 May	78°28.9N	4°07.0W	0609	20D	OS	camp
20 May	78°29.1N	4°07.8W	0715	20E	OS	camp
20 May	78°28.9N	4°08.7W	0951	20G	OS	camp
<b>XBT Stations</b>						
5 May	78°48.0N	02°00.0W	2255Z	1	T-4	ship
7 May	77°13.6N	02°36.2E	0310	5	T-7	ship
7 May	77°41.5N	02°14.7E	0445	6	T-7	ship
7 May	78°06.5N	04°00.1E	0700	7	T-7	ship
7 May	78°28.2N	04°39.6E	0845	8	T-7	ship
7 May	78°31.1N	04°06.4E	1050	9	T-7	ship
7 May	78°47.2N	02°48.0E	1325	10	T-7	ship
7 May	78°56.9N	02°03.5E	1445	11	T-7	ship
7 May	78°58.2N	01°14.8E	1930	13	T-4	ship
9 May	79°30.9N	01°06.1W	1300	17	T-4	ship
<b>S4 Stations</b>						
10 May	78°31.4N	0°30.4W	1100	1	S4	ship
15 May	79°08.6N	0°08.5E	2200	2	S4	camp

locations. Figure 8 contains measured depth profiles of temperature and conductivity from which salinity and acoustic sound speed are calculated.

### E. XBT Measurements

XBTs were collected using a Sippican MK IX recorder aboard *Northwind* during transit into the ice to locate the position of the Polar Front prior to establishing the ice camp. Model T-4 probes (460-m depth capability) were used, since an extremely high failure rate was experienced with the T-7 probes (760-m depth). The sensor

specifications for the probes are given in Table 4. A list of geographic locations is given in Table 3, and the figure in Appendix E shows a map of XBT locations. Figure 9 contains plots of the measured temperature profiles.

### F. Current Measurements

Current data were collected to determine the deformation of the acoustic arrays during the exercise. Since the current measurements were collected relative to the motion of the moving ice floe, absolute current speed

Table 4. XBT and current meter sensor specifications.

<b>XBT Probe Specifications</b>	
Depth Resolution:	60 cm
System Accuracy:	0.2°C
Resolution:	0.1°C
Range:	-2.0 to 38°C
<b>Current Meter Specifications</b>	
<i>Speed Sensor</i>	
Type:	Electromagnetic, 2-axis
Range:	0 to 350 cm/s
Resolution:	0.2 cm/s
Accuracy:	2% of reading $\pm 1$ cm/s
<i>Compass</i>	
Type:	Fluxgate Magnetometer
Range:	360°
Resolution:	0.5°
Accuracy:	2°
<i>Pressure</i>	
Type:	Semiconductor
Range:	0 to 1000 dBar
Resolution:	1 dBar
Accuracy:	$\pm 0.25\%$ full scale

and direction (relative to magnetic north) can only be implied by backing out the ice floe motion through correlation with the navigation. This was not done to the data set, since the currents were purposely measured to assess their effect on the arrays. The sensor specifications are given in Table 4. The list of geographic locations of the current measurements is given in Table 3 and a map of locations appears in Appendix D. Figure 10 gives the measured current speed and uncorrected direction (relative to magnetic north) profiles, and Figure 11 is the time series measurement of current speed and direction at a depth of 99 m at the ice camp during the exercise period (15-21 May 1988).

#### IV. Preliminary Analysis

Figure 12 illustrates a temperature section constructed from XBTs 8 through 17 collected during transit into the ice pack. The most prominent feature is the temperature maximum, which represents the core of the AIW. This feature, which is continuous throughout the section, generally increases in depth toward the west. The 0°C isotherm, the classical designator of the mean position of the Polar Front, exhibits the same tendency. The slope of these features is not as great as observed elsewhere in the literature, since the Polar Front was traversed at an oblique angle. The surface position of the Polar Front (i.e., that range at which the 0°C isotherm is present at the sea surface) lies between XBTs 8 and 9 near the origin of the transit. According to logs compiled during the exercise, this position correlates well with the ice edge. Satellite imagery obtained during this period

Table 5. Polar Front depth and thermocline measured from XBT data.

XBT	0°C depth (m)	Avg. Gradient (°C/m)	Standard Deviation
1	--	.014	.01
5	48	.016	.08
6	23	.004	.14
7	0	.055	.17
8	0	.090	.24
9	49	.065	.24
10	20	.025	.03
11	76	.019	.03
13	61	.012	.05
17	118	.021	.04

will be analyzed to provide a more accurate correlation. The subsurface temperature minimum is probably a result of the effects of surface warming, since all data were collected during periods while transiting in open leads. Table 5 gives the temperature gradient and depth of the water mass interface, as well as the depth of the Polar Front, as determined by the position of the 0°C isotherm. The temperature gradient at the interface of the two water masses shows significant spatial variability. Fluctuation of the gradient within each profile increases as the Polar Front approaches the surface and decreases as the front deepens.

The experiment was located within the pack ice approximately 50 nmi west of the surface manifestation of the Polar Front. The depth of the Polar Front below the ice camp (as determined by the depth of the 0°C isotherm) was generally 100 m but varied from 50 to 165 m within the experimental area. The oceanographic structure in the sound speed profile, significant to both high- and low-frequency acoustic propagation, was observed both along and below the depth of the frontal interface. This variability is caused by the interleaving of the Polar Water and AIW along the frontal boundary. Temperature and, hence sound speed, inversion layers tens of meters thick were common in the depth range of 100-500 m. The sound speed excursion within any layer was frequently of the order of 1.5 m/s. Significant temporal variability was observed in the sound speed structure, and marked differences were present between the down- and up-casts of the CTDs (a span of about 20 minutes).

Ice-cover concentrations will play an extremely important role in subsequent analysis of acoustic propagation data. Based on reconnaissance and satellite photos, NPOC<sup>3</sup> provided several detailed charts of ice cover during the exercise. These charts are compared with the historic chart for May<sup>4</sup> in Figure 13. These depictions were modified for easier comparison by reducing the number of divisions describing ice coverage. On a large scale, the observed ice coverage is very

consistent with historical information, both for large ice concentrations (60-100%) and open water areas. However, areas of 20% to 50% ice cover demonstrate significant variability when comparing historic and observed ice cover. Figure 14 shows two NPOC charts that delineate ice limits 1 week apart during the exercise. A dramatic difference in both the positional boundaries and the distribution of the ice percentage categories is apparent. During the seven helicopter sorties in the exercise area, it was noted that ice concentrations within the MIZ are, on a high-resolution scale, quite diverse. For example, an acoustic propagation radial in this region may extend along the axis of large open water leads of 5 to 10 miles in length. Hence, large geographical depictions of ice cover may be misleading when determining actual ice concentrations along discrete radials.

Meteorological conditions were generally "well behaved" during the period of ice camp occupation. Table 6 provides weather data statistics and correlation data for temperature, wind speed and direction, pressure, and solar energy. The surface temperature and solar energy temporal plots (Fig. 7) exhibit a strong diurnal variability. Superimposed on the surface temperature time series is the larger scale variability of meteorological frontal movement. Generally, a rise in the surface barometric pressure precipitates a decrease in the average temperature due to clearing weather and the entry of a polar air mass into the area. These trends are present in Figure 7; however, verification of this mechanism must await the assessment of historical surface pressure and geostrophic wind charts compiled during this same period by FNOC.

As discussed, both vertical current meter casts and a time series station were collected in support of acoustic array deformation assessment. Unfortunately, only two

vertical current casts were completed before instrument failure occurred. These casts exhibit highly dissimilar current velocities and directions, especially in the vicinity of 100 to 150 m. A correlation of this data with the floe translation rate will be made to at least partially explain differences. The current meter time series, measured at a depth of 99 m, also exhibits large-scale speed variability. A cursory comparison of the navigation data with the current speeds at this depth shows that the floe moved at a relatively constant speed and direction. The correlation of floe and current direction appears to be high, but correlation with respect to the speeds appears to be low. Both the vertical current meter and time series data sets exhibit current speeds (often in excess of 0.5 kt) that will have an adverse effect on array linearity. An effort will be made to correlate this data with inclinometers mounted on the array to establish a time history of the effect the currents had on array deformation.

As an observational footnote, the oceanographic phenomenon known as the Ekman spiral can be seen in the current profile from cast 2. This spiral is the effect of the Coriolis force due to the earth's rotation; as a result, surface water does not move downwind but at right angles, and current direction in successive layers of water will spiral as a function of depth.<sup>5</sup> In Table 7 raw current measurements are tabulated for the first 100 m, along with corresponding surface wind speed and corrected direction. The current direction changes rapidly clockwise with depth for the first 25 m and then becomes fairly steady. The wind direction seems to fluctuate slightly about 1°T, and the angle between the wind and the current direction at 8.8 m is larger than the expected 20°-40°. This increase occurs because the current data is sampled too coarsely in depth, and 8.8 m may be too deep to get the surface current due to the high rate of current direction changes with depth observed here.

Table 6. Weather statistics and correlation during exercise period.

Weather Statistics					
	Count	Mean	Std. Dev.	Min	Max
Temp (°C)	578	-5.1	2.4	-9.0	-0.02
Wind speed (mph)	578	16.8	5.4	1.1	27.6
Barometer (inches)	578	30	0.3	29.4	30.2
Solar Energy (W/m <sup>2</sup> )	578	213.4	135.3	19	622

Correlation Table					
	Solar Energy (W/m <sup>2</sup> )	Wind Temp (°C)	Wind Speed (mph)	Direction (°T)	Barometer (inches)
Solar Energy (W/m <sup>2</sup> )	1				
Temp (°C)	0.02	1			
Wind Speed (mph)	-0.2	-0.35	1		
Wind Direction (°T)	0.07	-0.30	0.27	1	
Barometer (inches)	0.24	-0.72	0.28	0.36	1

Table 7. Comparison of current and wind speeds and directions.

Current S4 Cast #2		
Depth (m)	Direction (°T)	Speed (cm/s)
8.8	113.1	13.7
10.8	186.2	6.7
11.7	339.0	5.6
12.7	347.2	8.1
13.7	9.2	15.0
19.6	28.9	13.2
25.4	48.4	16.6
31.3	59.7	16.7
37.1	60.6	18.4
40.1	67.4	18.2
43.0	65.2	20.0
46.9	72.4	17.8
48.9	68.8	21.0
51.8	73.0	17.1
53.8	69.0	25.1
57.7	74.9	17.6
59.6	66.4	31.0
63.5	73.8	17.9
65.5	66.4	32.5
69.4	70.9	17.1
70.4	68.4	34.2
75.3	70.5	17.4
75.3	70.4	34.6
80.2	69.3	34.4
81.1	69.6	17.5
85.0	71.2	35.3
86.0	69.1	18.0
89.0	71.0	36.8
90.9	70.1	17.0
92.9	72.3	36.9
96.8	76.4	17.9
97.8	74.7	37.1
101.7	76.5	38.7
Wind		
Date/Time	Speed (mph)	Direction (°T)
5/15 21:46	21.6	12.0
5/15 22:01	22.5	4.0
5/15 22:16	21.8	-4.0
5/15 22:31	22.0	1.0
5/15 22:46	19.5	-7.0
5/15 23:01	18.8	0
Average	21.0	1.0
Std. Dev.	1.4	6.1

## V. Lessons Learned

Failures occurred in some of the environmental equipment. An 80% failure rate in the XBTs was

experienced upon sampling the outer ice edge; two CTD units and one current meter malfunctioned. The high failure rate (80%) of the XBTs prevented the collection of the desired amount of data, so the *Northwind* graciously provided several XBTs. Ten XBT data sets were acquired. A second current meter, deployed to collect a time series data set at a depth of 99 m, could not be retrieved for use in vertical profiling.

May might not have been the optimum month for these MIZ acoustic propagation experiments because much of the deep-water ice cover is still far to the north. Pre-exercise MPA flights were invaluable in identifying multiyear ice areas suitable for ice camp habitation. Without these sorties, sea fog, which is prevalent at this time of year, would have severely hampered helicopter operations for ice floe selection.

A self-recording gyrocompass is necessary for consistent and accurate determination of ice camp floe orientation needed for acoustic array performance analysis. A Fluxgate compass is also necessary to check gyrocompass accuracy. Present orientation measurement methods require either the sun or icebreaker gyro reference and a surveyor's transit. Poor visibility often precludes making enough of these measurements, especially in the MIZ where orientation varied rapidly.

## VI. References

1. D. A. Horn and G. L. Johnson (1985). MIZEX East, past operations and future plans. *Proceedings of the Arctic Oceanography Conference and Workshop*, June 11-14.
2. B. G. Hurdle, ed. (1986). *The Nordic Seas*. Springer-Verlag, NY.
3. *Southern Ice Limit Charts* (1988). Navy Polar Ice Center, Suitland, MD, 1988.
4. *Sea Ice Climatic Atlas Volume II: Arctic East* (1986). Naval Oceanography Command Det., Asheville, NC.
5. J. A. Knauss (1978). *Introduction to Physical Oceanography*. Prentice-Hall, Inc., Englewood, NJ.



Figure 1. Satellite image of exercise area.

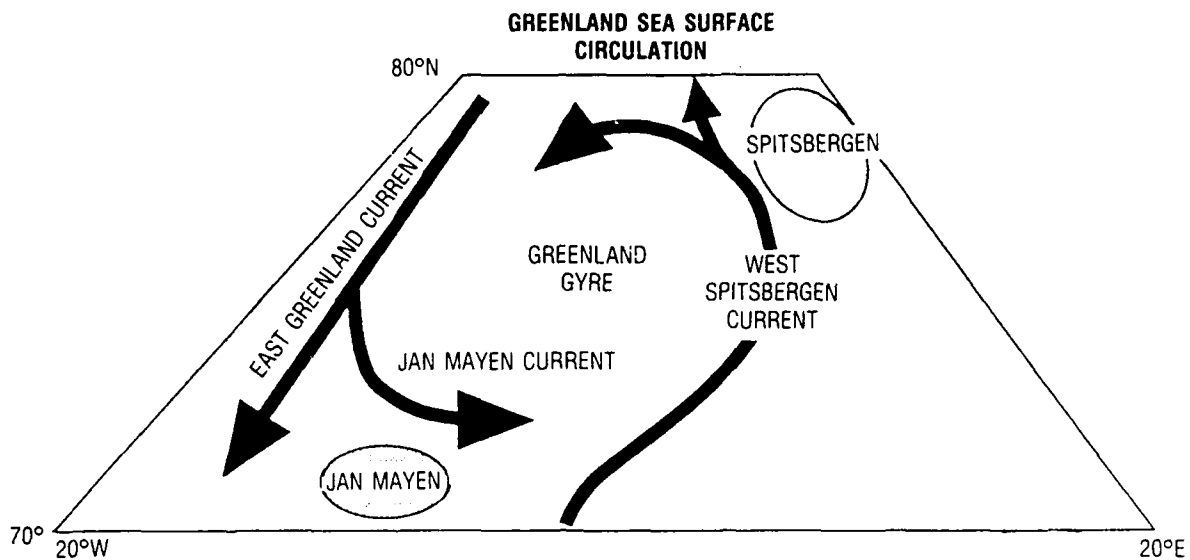


Figure 2. Oceanographic overview of exercise area.

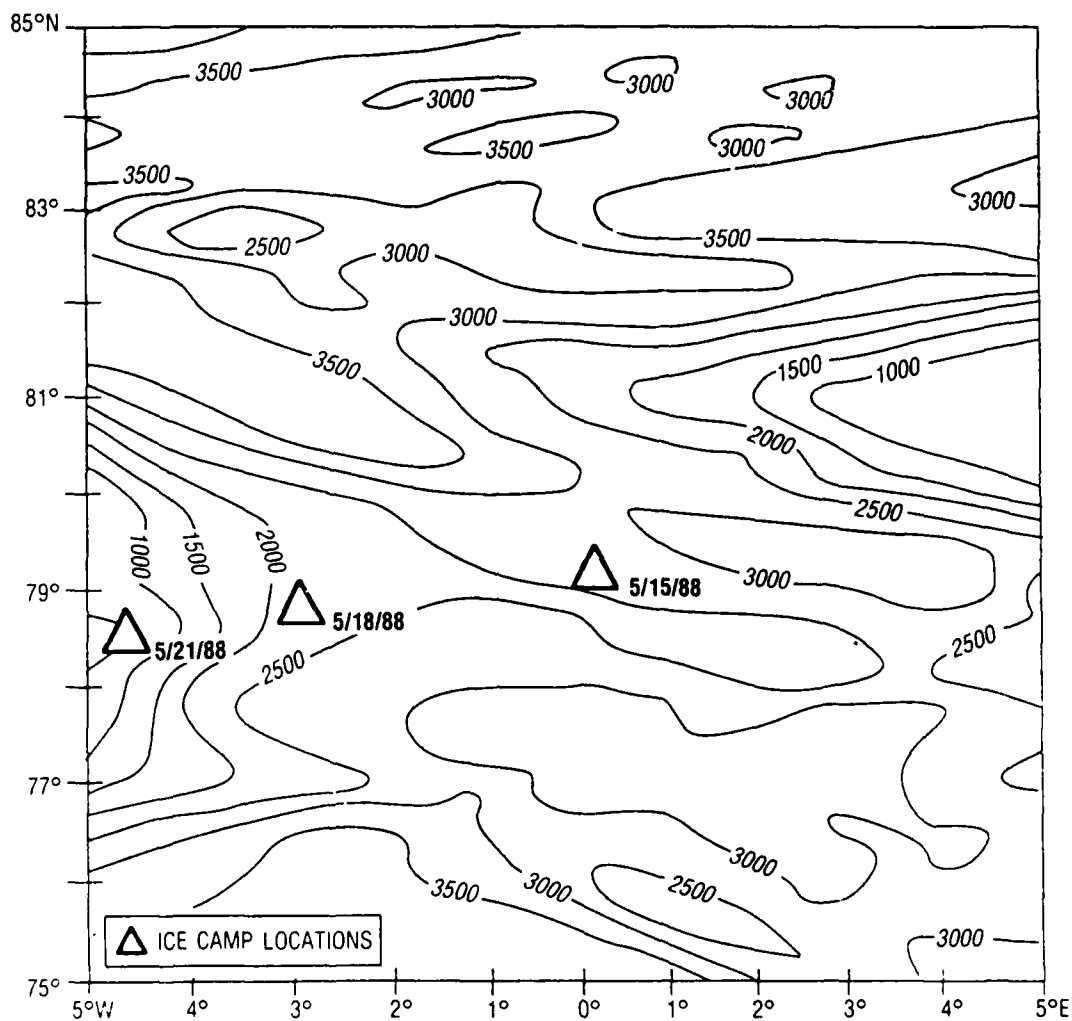


Figure 3. Bathymetry over exercise area.

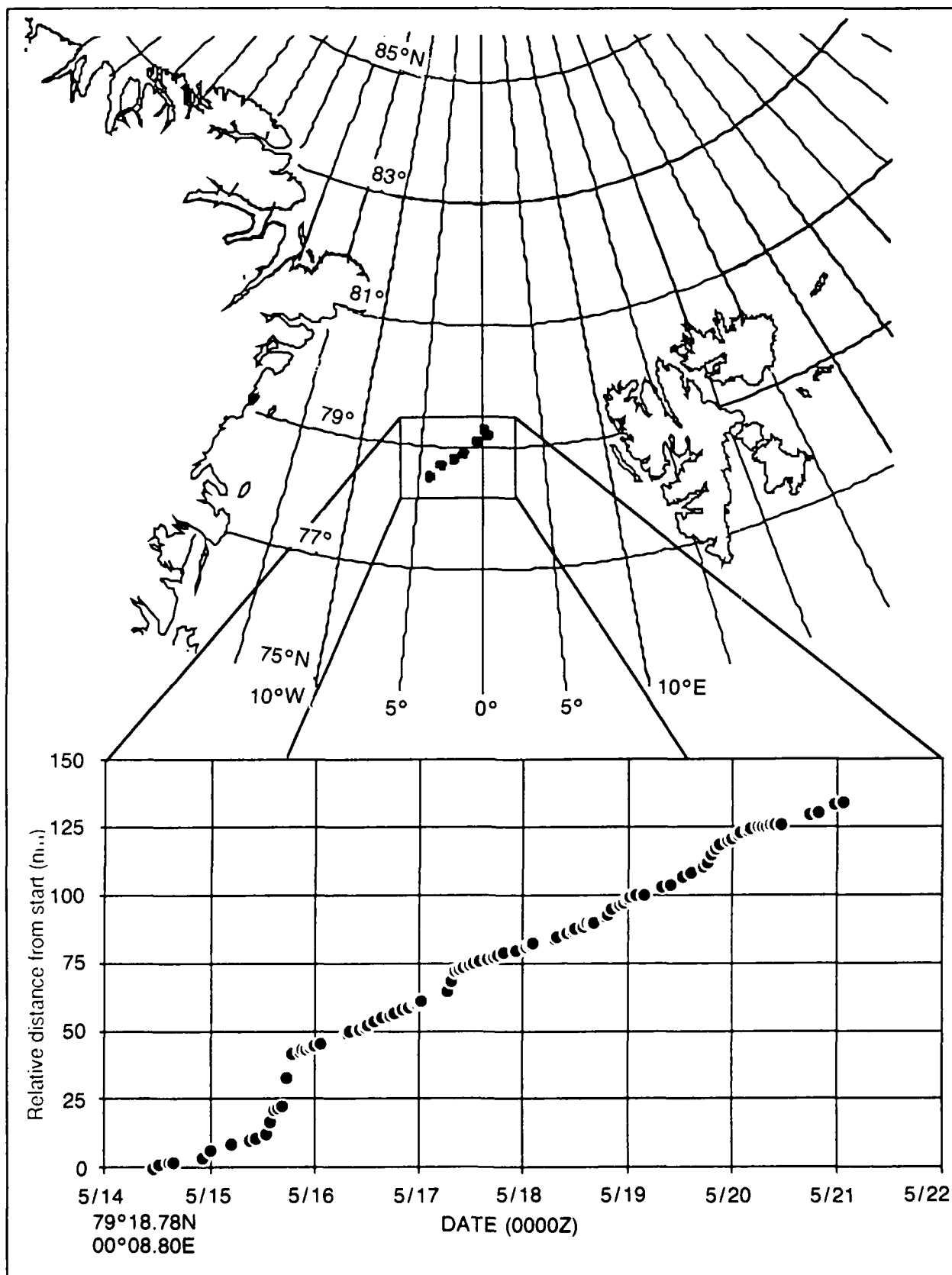


Figure 4. Navigation plots of exercise area.

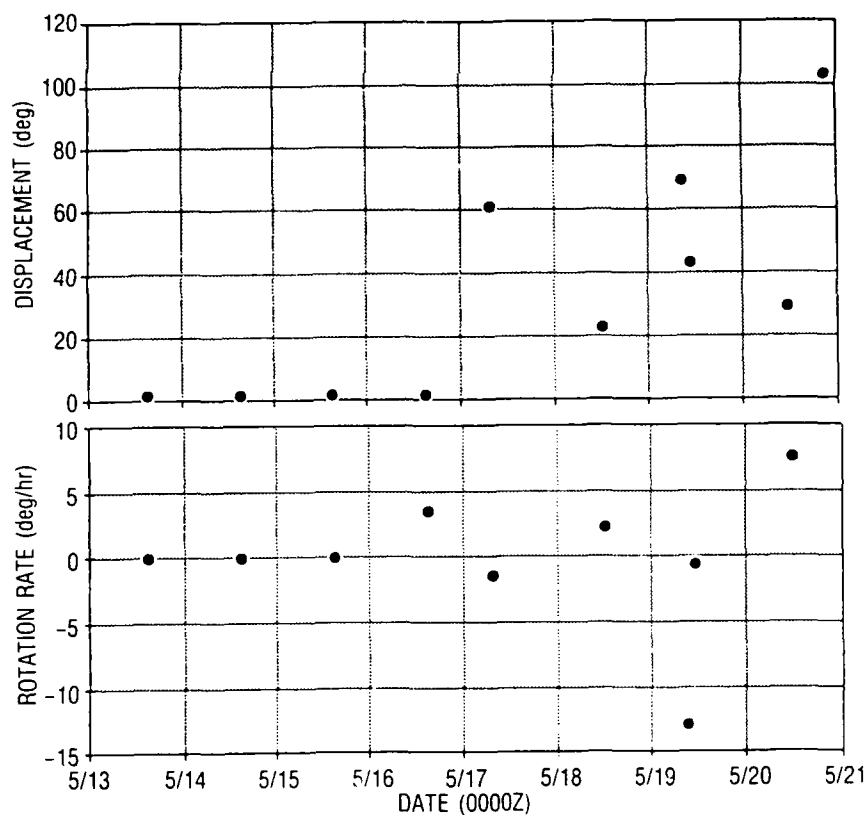


Figure 5. Ice floe rotational displacement and rate.

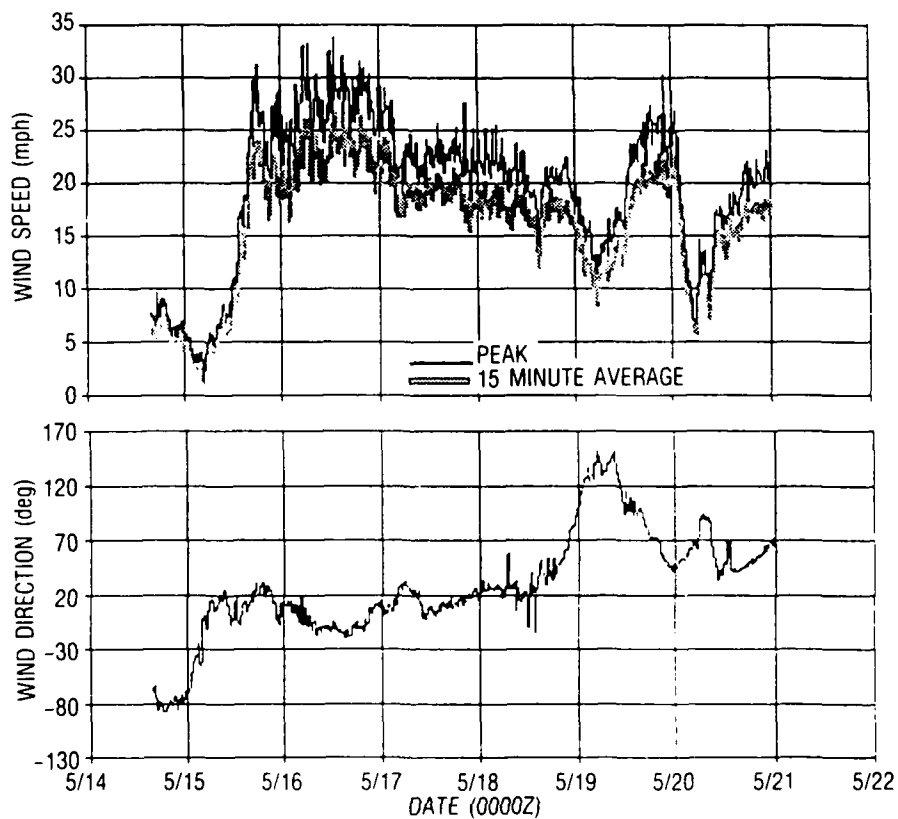


Figure 6. Surface wind velocity and direction.



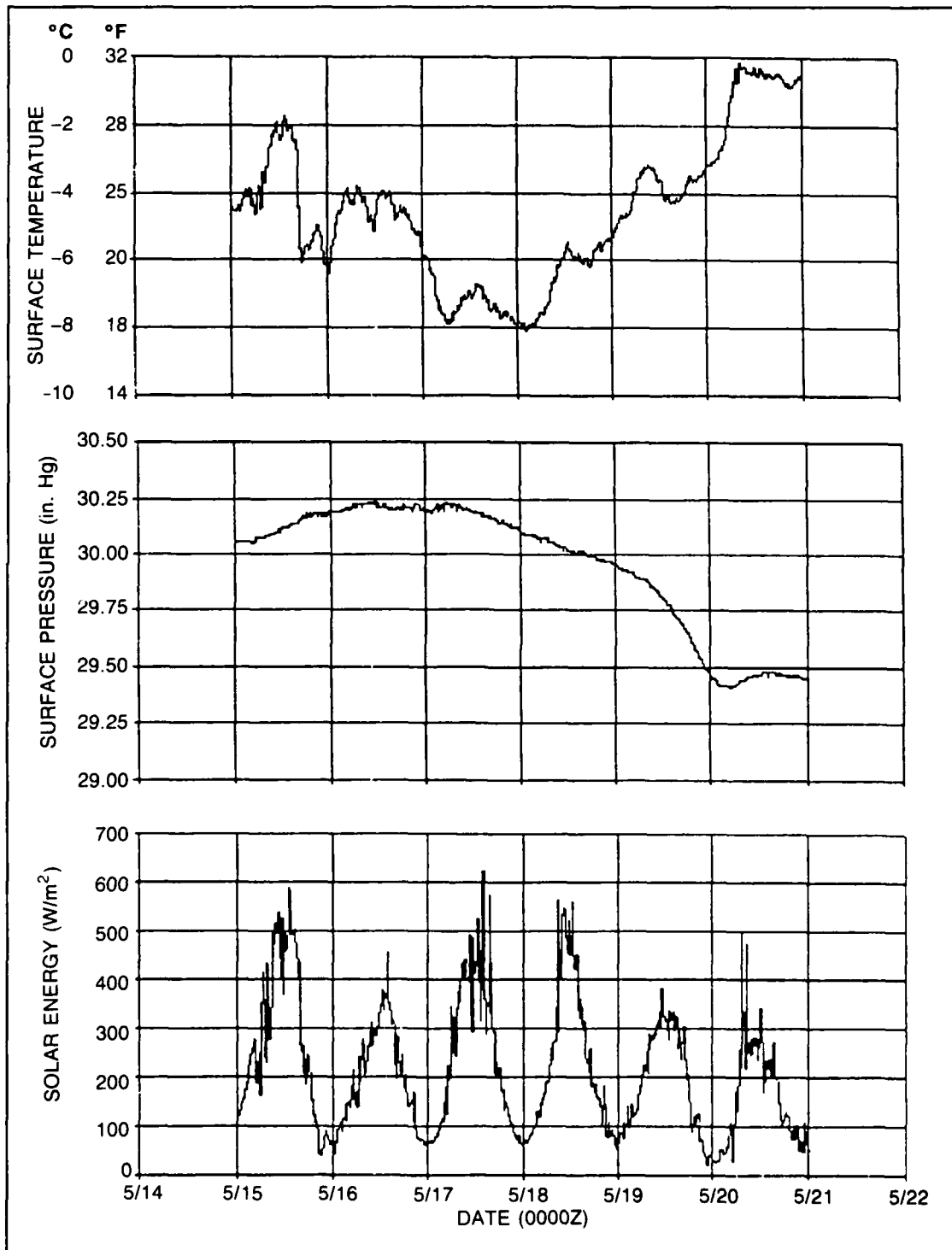


Figure 7. Surface temperature, pressure, and incident solar energy.

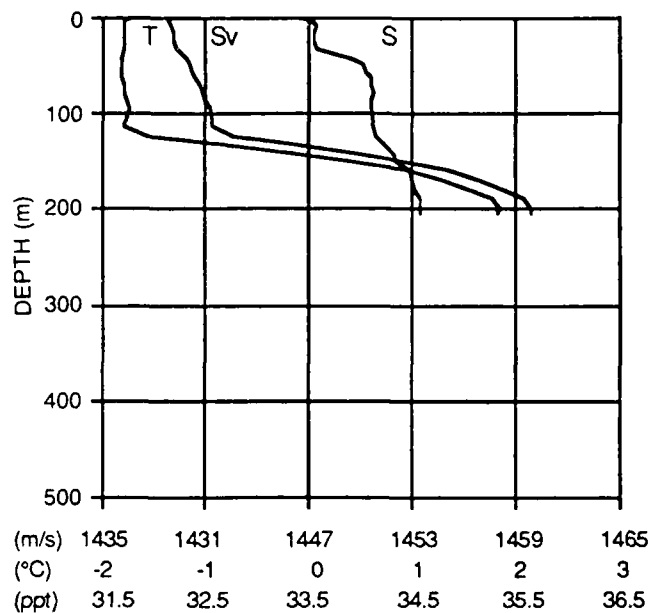
**Cast 1**

May 10, 1988

Time: 1615Z

Lat 79:33.7N

Long 000:54.9W

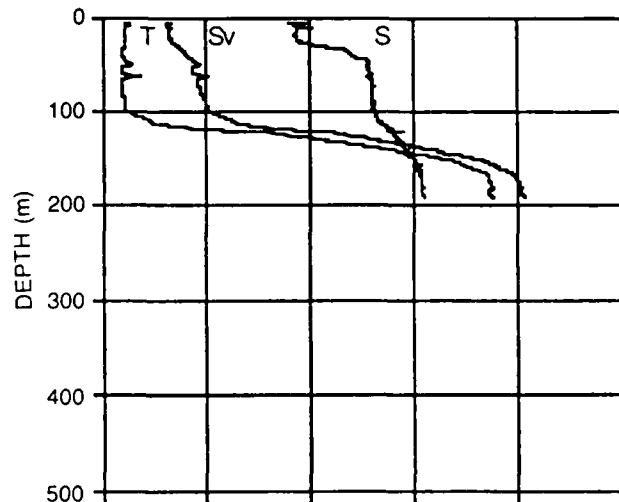
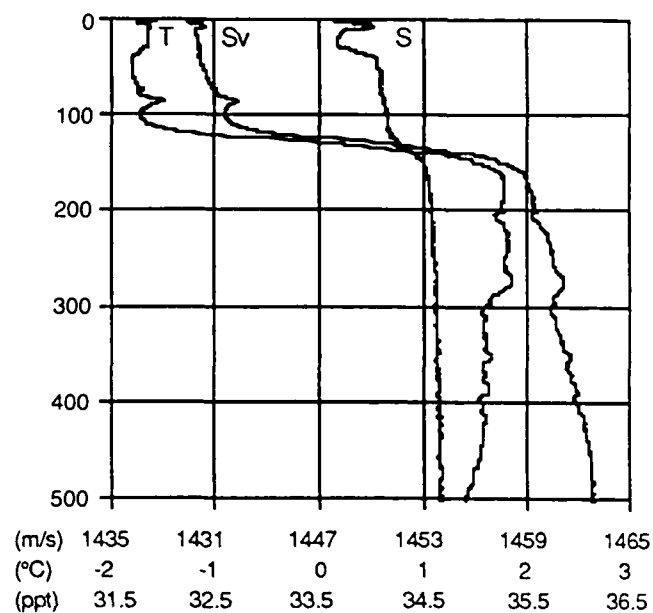
**Cast 3**

May 13, 1988

Time: 1545Z

Lat 79:22.4N

Long 000:02.2E

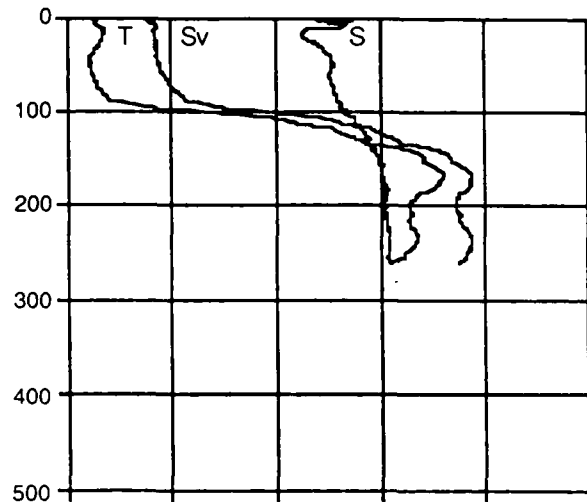
**Cast 2**

May 11, 1988

Time: 0900Z

Lat 79:32.6N

Long 000:29.6W

**Cast 4**

May 14, 1988

Time: 2330Z

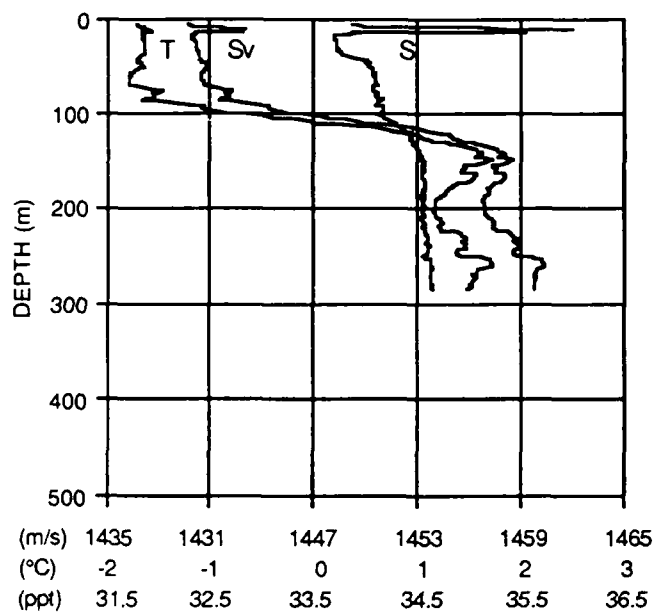
Lat 79:15.6N

Long 000:12.7W

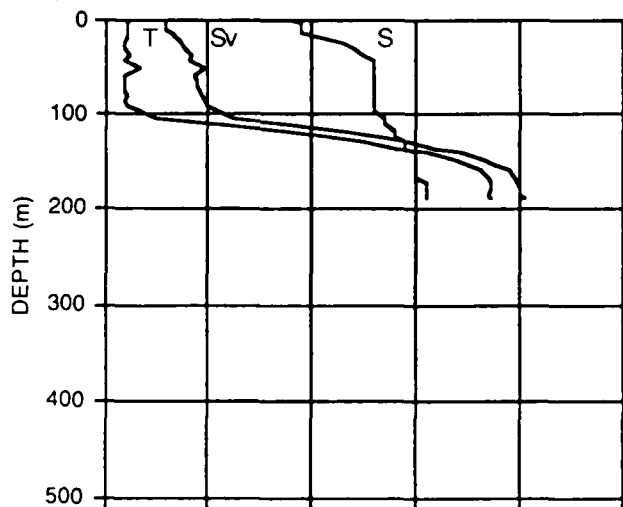
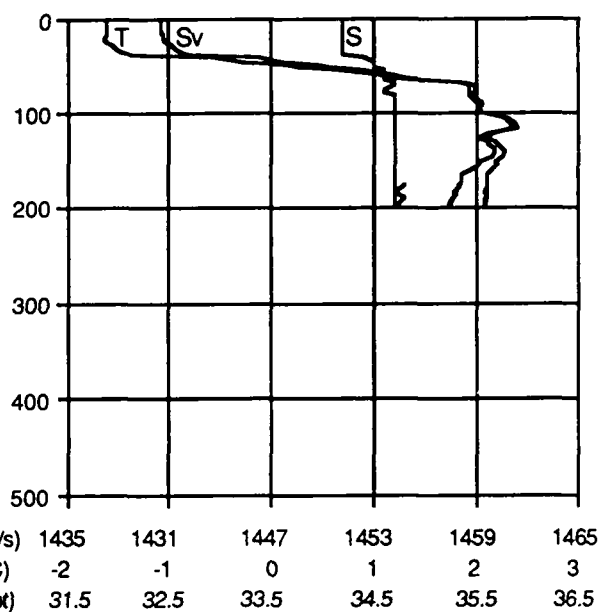
Figure 8. CTD profiles.

**Cast 5**

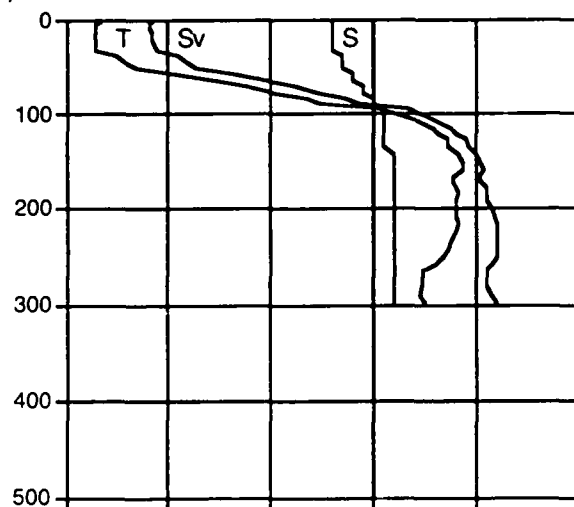
May 15, 1988  
 Time: 2340Z  
 Lat 79:08.8N  
 Long 000:05.13E

**Cast 12B**

May 12, 1988  
 Time: 0930Z  
 Lat 79:27.5N  
 Long 002:13.0E

**Cast 11A**

May 11, 1988  
 Time: 0900Z  
 Lat 79:32.6N  
 Long 000:29.6W

**Cast 12C**

May 12, 1988  
 Time: 1100Z  
 Lat 79:13.5N  
 Long 000:43.0E

Figure 8 continued.

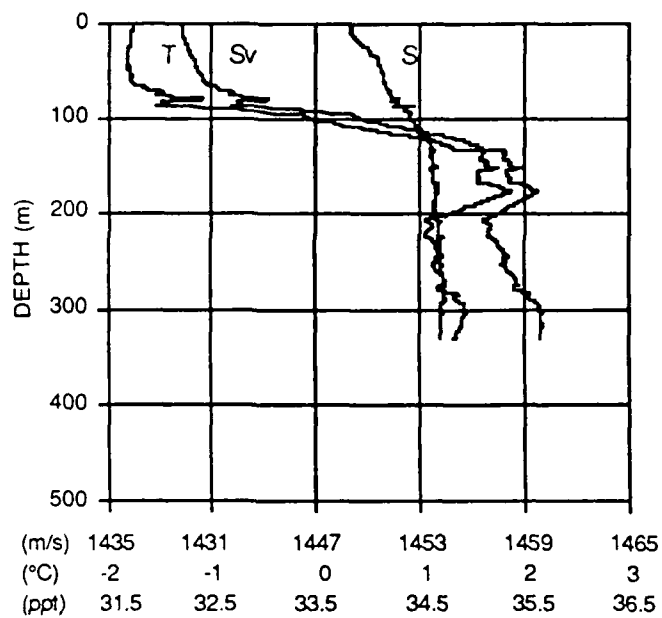
**Cast 12D**

May 12, 1988

Time: 1130Z

Lat 79:10.7N

Long 000:04.0E

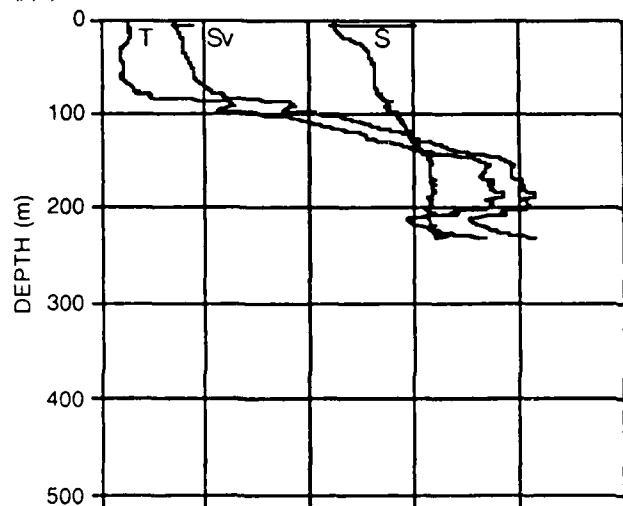
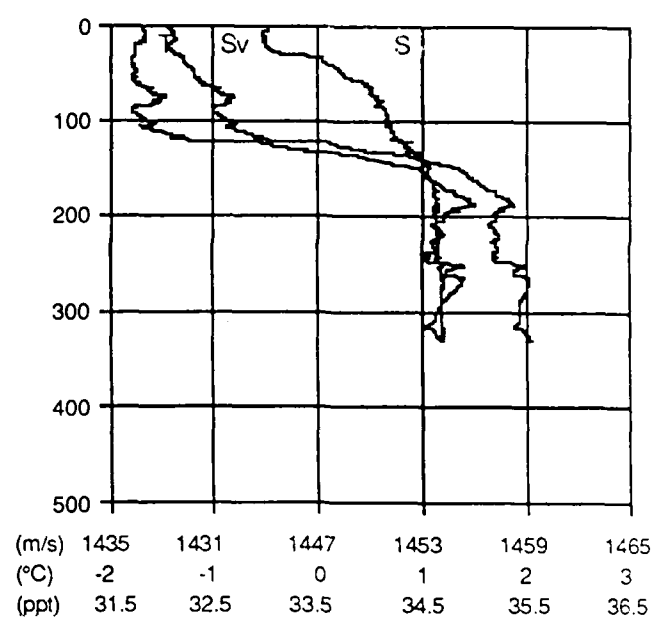
**Cast 12F**

May 12, 1988

Time: 1500Z

Lat 79:25.7N

Long 002:30.0W

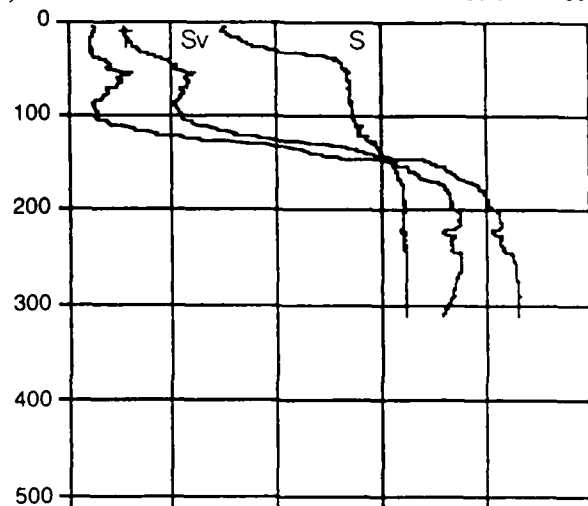
**Cast 12E**

May 12, 1988

Time: 1200Z

Lat 79:21.0N

Long 000:04.0W

**Cast 12G**

May 12, 1988

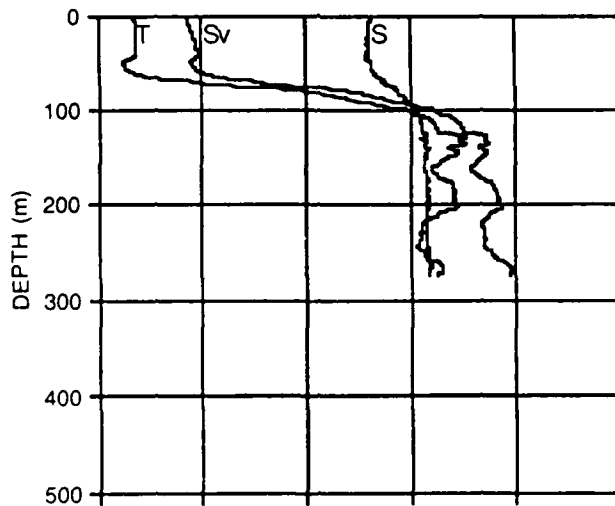
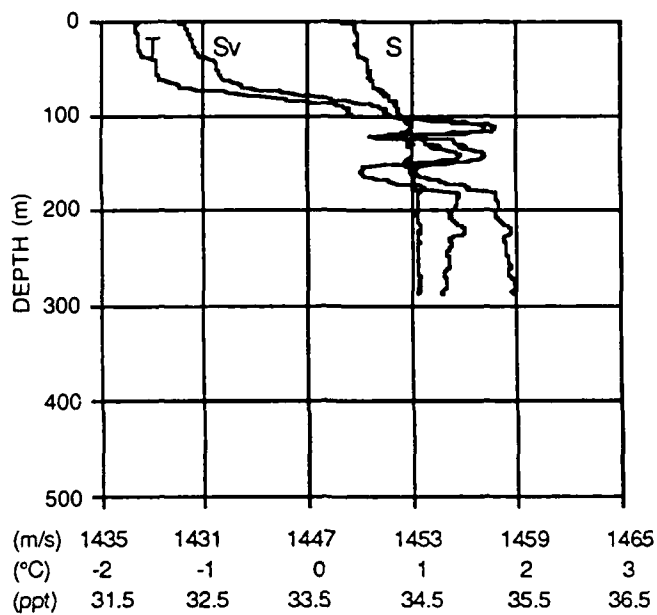
Time: 2150Z

Lat 79:28.2N

Long 001:36.0W

*Figure 8 continued.*

**Cast 16A**  
 May 16, 1988  
 Time: 1930Z  
 Lat 78:40.5N  
 Long 002:38.0W



**Cast 16B**  
 May 16, 1988  
 Time: 1951Z  
 Lat 78:47.5N  
 Long 002:04.0W

*Figure 8 continued.*

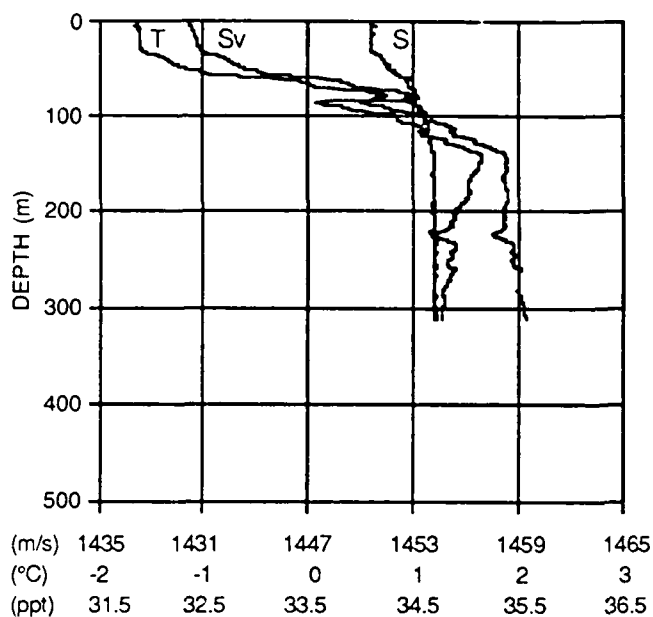
**Cast 16C**

May 16, 1988

Time: 2016Z

Lat 78:49.8N

Long 001:24.0W

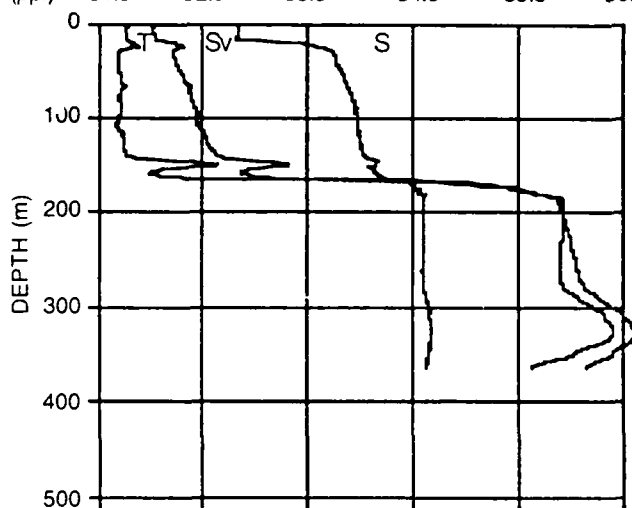
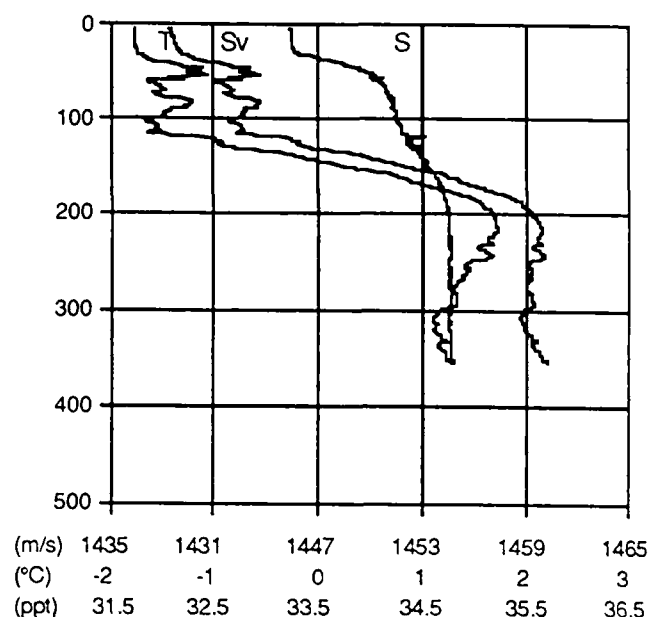
**Cast 17B**

May 17, 1988

Time: 1503Z

Lat 79:14.3N

Long 002:37.0W

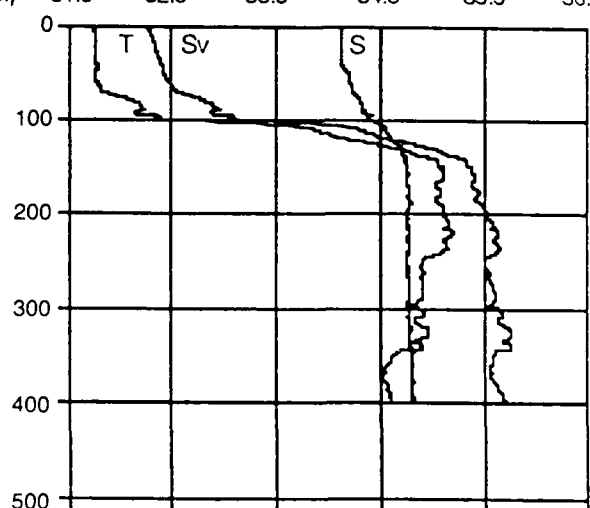
**Cast 17A**

May 17, 1988

Time: 1443Z

Lat 79:22.2N

Long 002:51.0W

**Cast 17C**

May 17, 1988

Time: 1533Z

Lat 79:03.5N

Long 001:48.0W

*Figure 8 continued.*

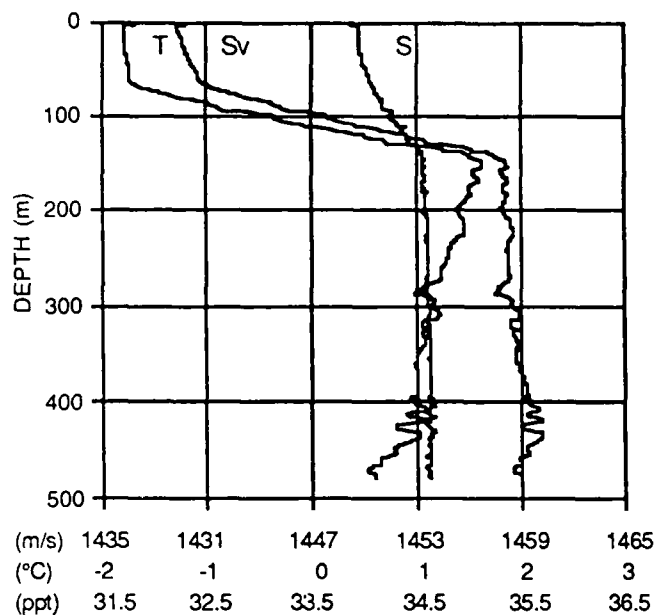
**Cast 18A**

May 18, 1988

Time: 1000Z

Lat 78:52.5N

Long 002:08.3W

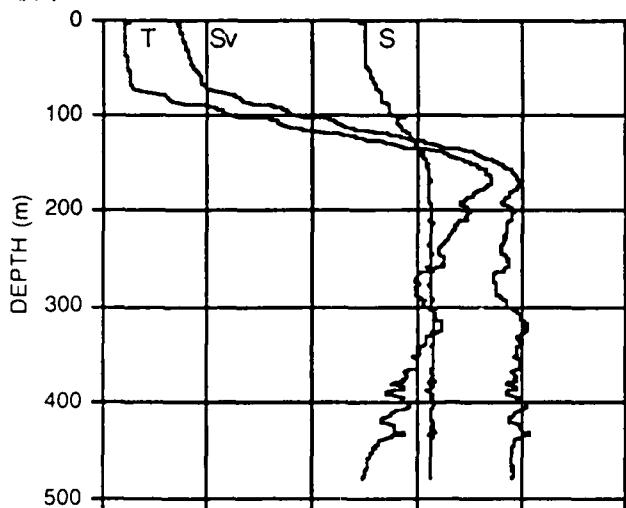
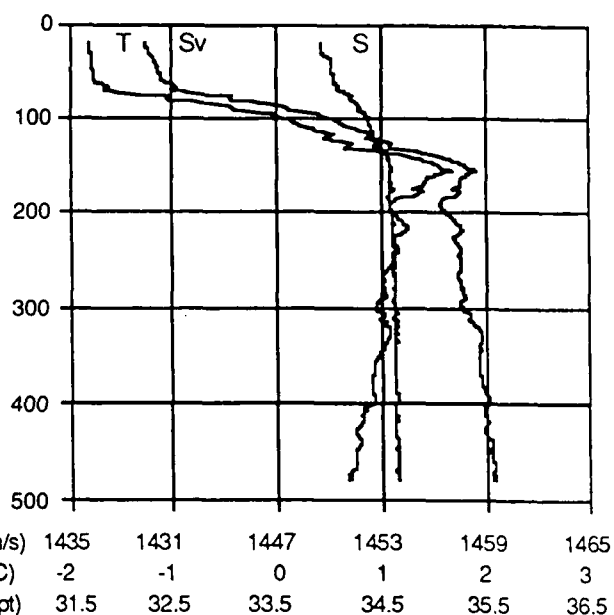
**Cast 18C**

May 18, 1988

Time: 1730Z

Lat 78:52.0N

Long 002:20.0W

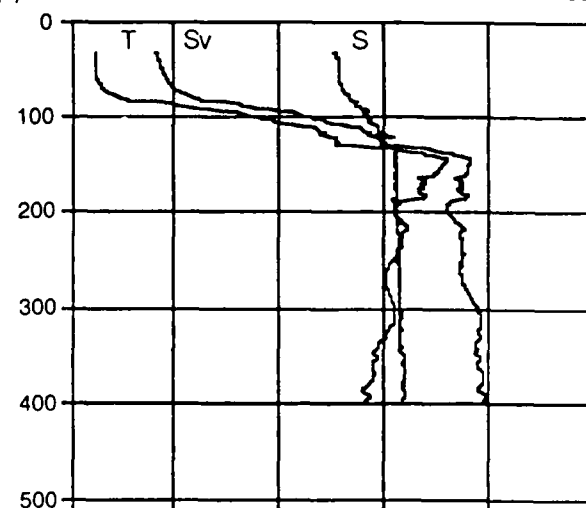
**Cast 18B**

May 18, 1988

Time: 1030Z

Lat 78:52.0N

Long 002:16.0W

**Cast 18D**

May 18, 1988

Time: 1830Z

Lat 78:49.9N

Long 002:22.6W

*Figure 8 continued.*

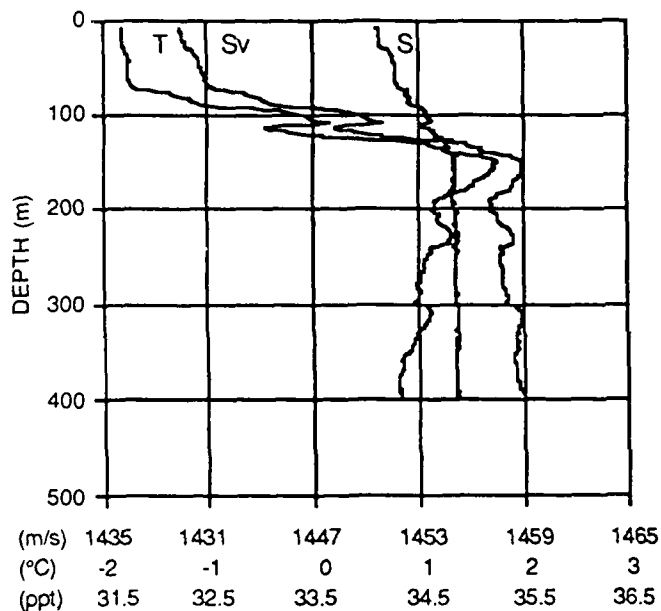
**Cast 18E**

May 18, 1988

Time: 2120Z

Lat 78:49.1N

Long 002:26.0W

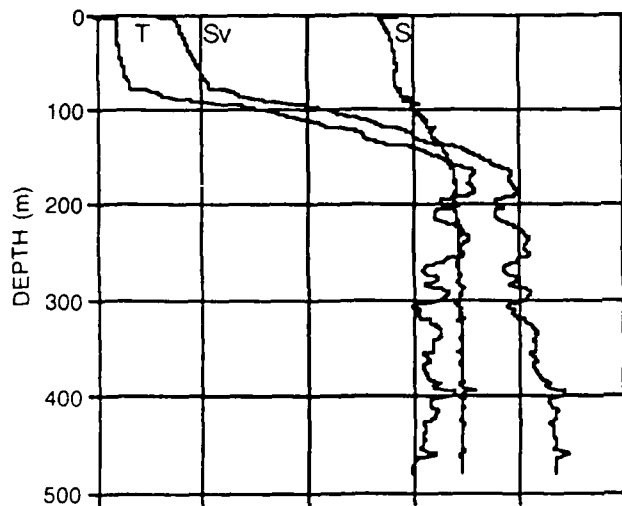
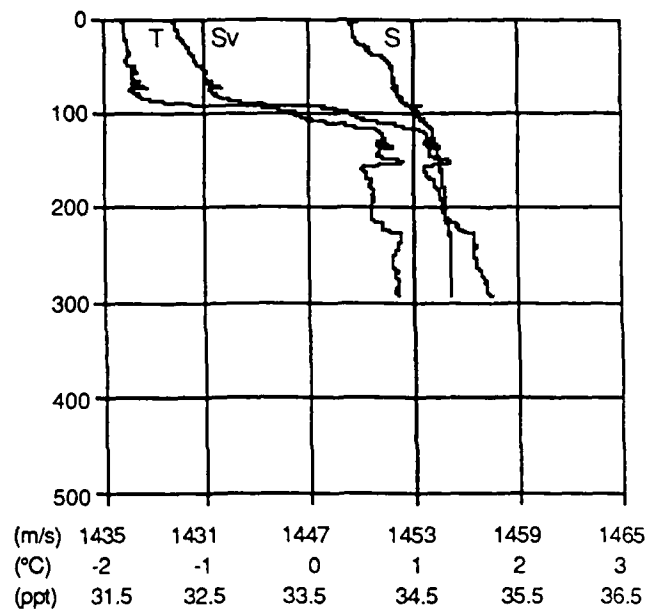
**Cast 19C**

May 19, 1988

Time: 1838Z

Lat 78:35.2N

Long 003:32.1W

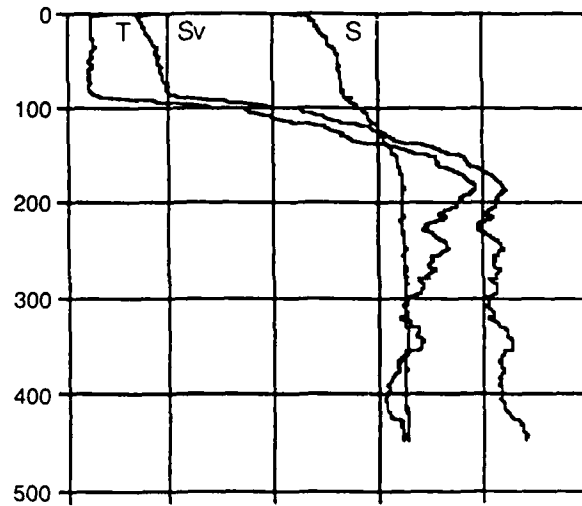
**Cast 19B**

May 19, 1988

Time: 1104Z

Lat 78:44.0N

Long 002:56.0W

**Cast 20A**

May 20, 1988

Time: 0138Z

Lat 78:29.6N

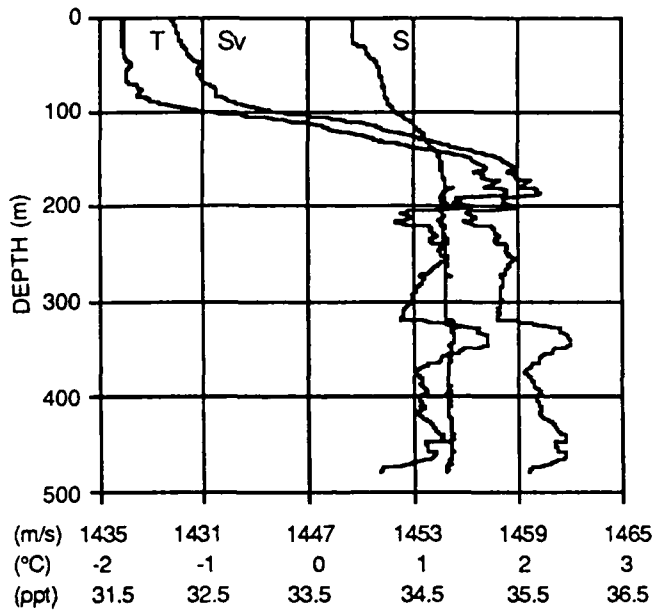
Long 003:56.4W

*Figure 8 continued.*

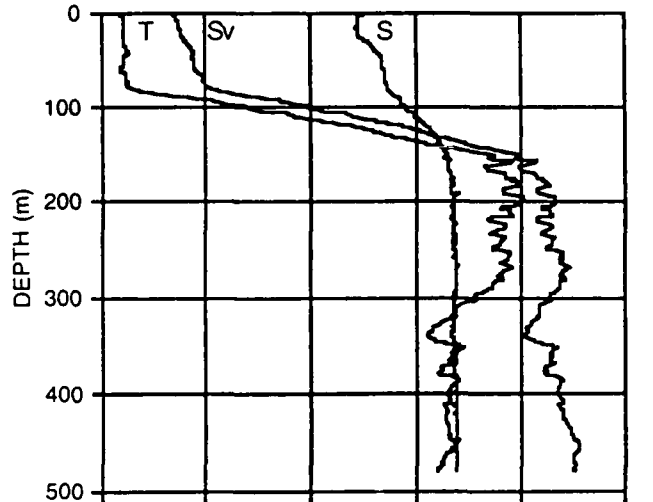
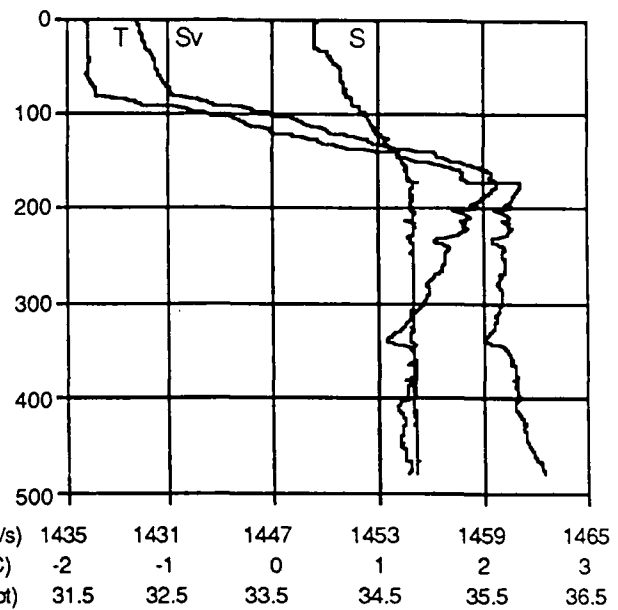


**Cast 20B**

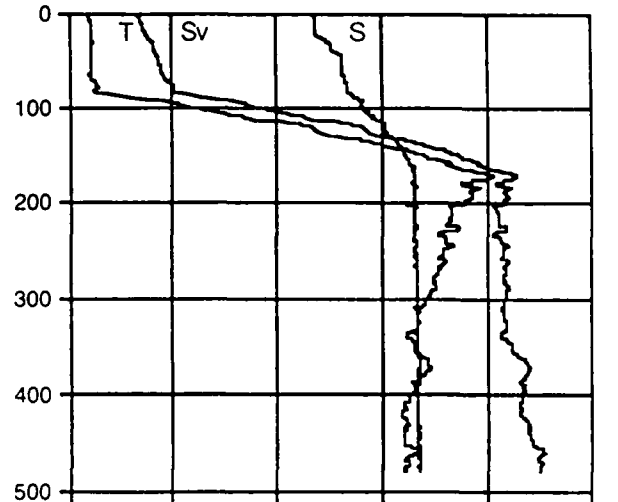
May 20, 1988  
Time: 0252Z  
Lat 78:29.4N  
Long 003:57.2W

**Cast 20D**

May 20, 1988  
Time: 0900Z  
Lat 78:28.9N  
Long 004:07.0W

**Cast 20C**

May 20, 1988  
Time: 0428Z  
Lat 78:28.6N  
Long 004:02.8W

**Cast 20E**

May 20, 1988  
Time: 0715Z  
Lat 78:29.1N  
Long 004:07.8W

Figure 8 continued.

**Cast 20G**  
 May 20, 1988  
 Time: 0951Z  
 Lat 78:28.9N  
 Long 004:08.7W

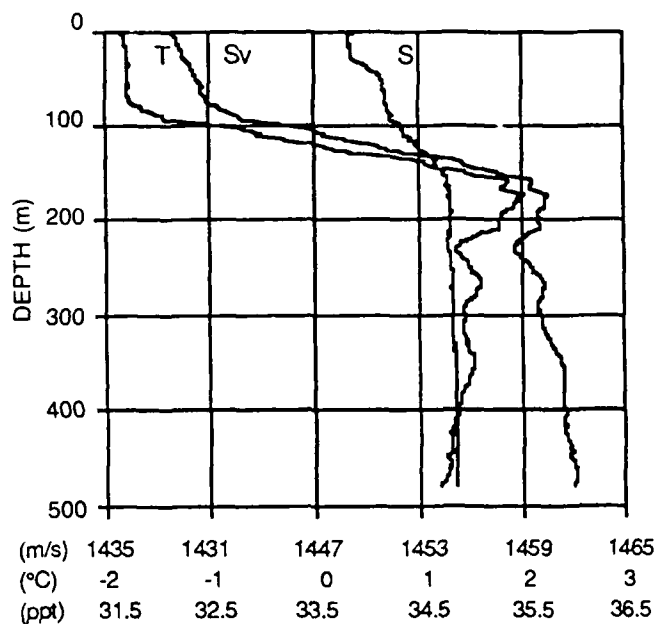


Figure 8 continued.

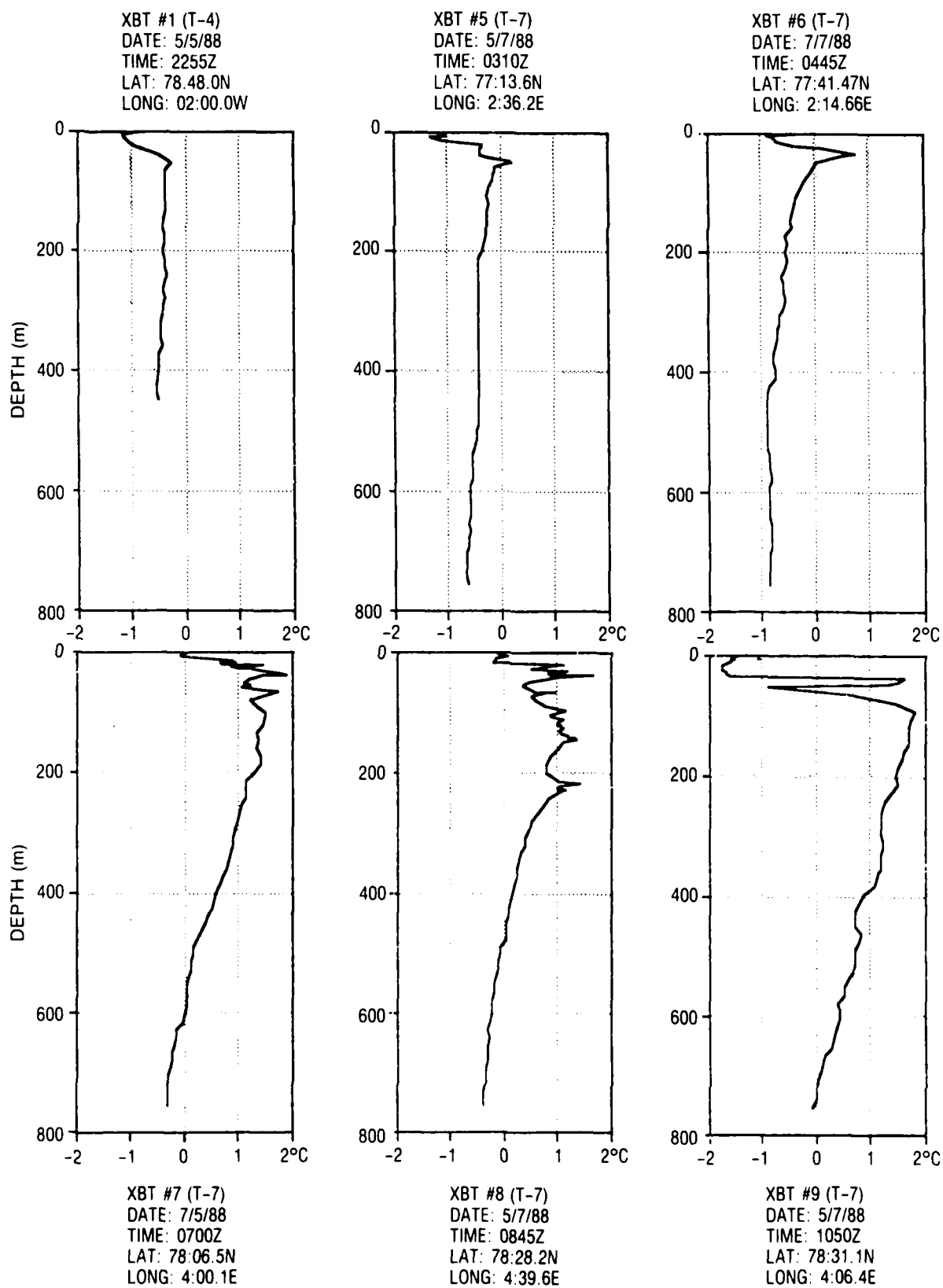
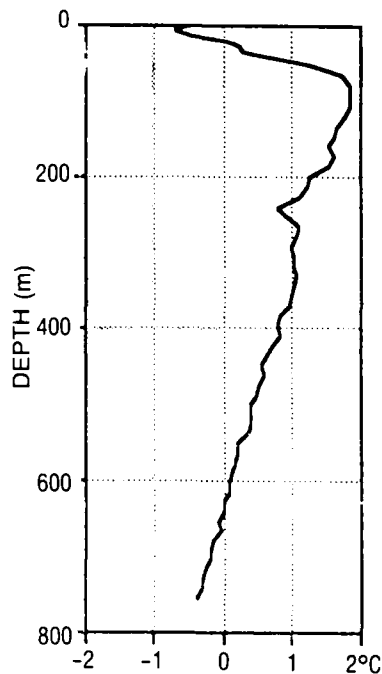
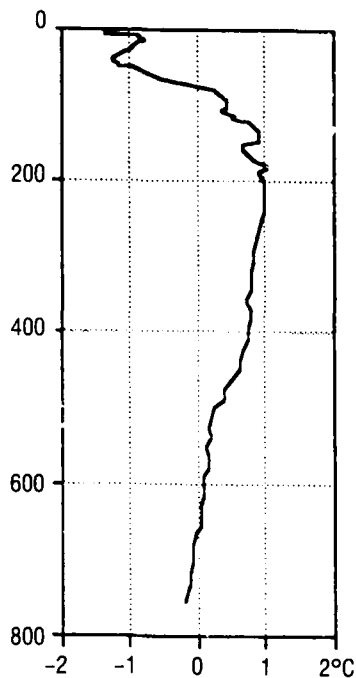


Figure 9. XBT profiles.

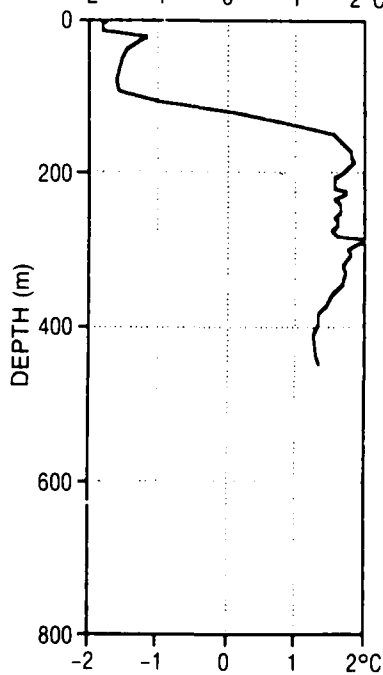
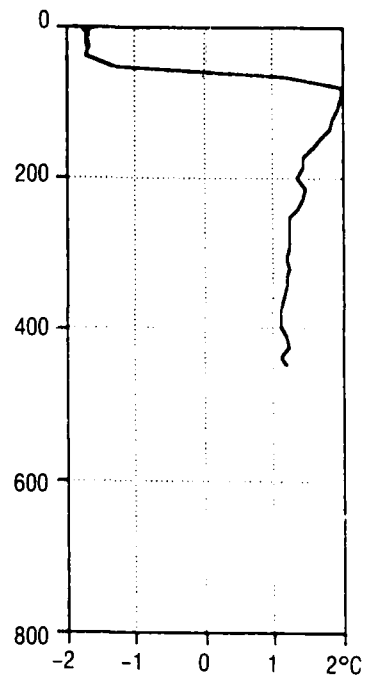
XBT #10 (T-7)  
 DATE: 5/7/88  
 TIME: 1325Z  
 LAT: 78:47.2N  
 LONG: 2:47.99E



XBT #11 (T-7)  
 DATE: 5/7/88  
 TIME: 1445Z  
 LAT: 78:56.9N  
 LONG: 2:03.5E



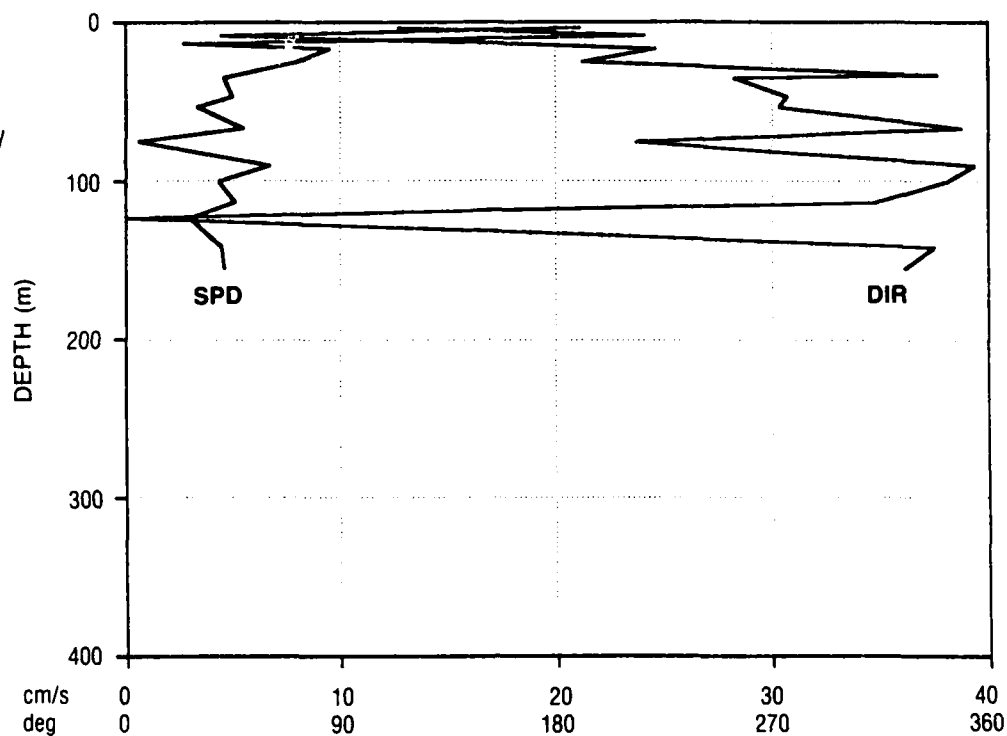
XBT #13 (T-4)  
 DATE: 5/7/88  
 TIME: 1930Z  
 LAT: 78:58.2N  
 LONG: 1:14.85E



XBT #17 (T-4)  
 DATE: 5/9/88  
 TIME: 1300Z  
 LAT: 79:30.9N  
 LONG: 1:06.1W

Figure 9 continued.

**Cast 1**  
 May 10, 1988  
 Time 1100Z  
 Lat 79:31.4N  
 Long 000:30.4W



**Cast 2**  
 May 15, 1988  
 Time 2200Z  
 Lat 79:08.6N  
 Long 000:08.5E

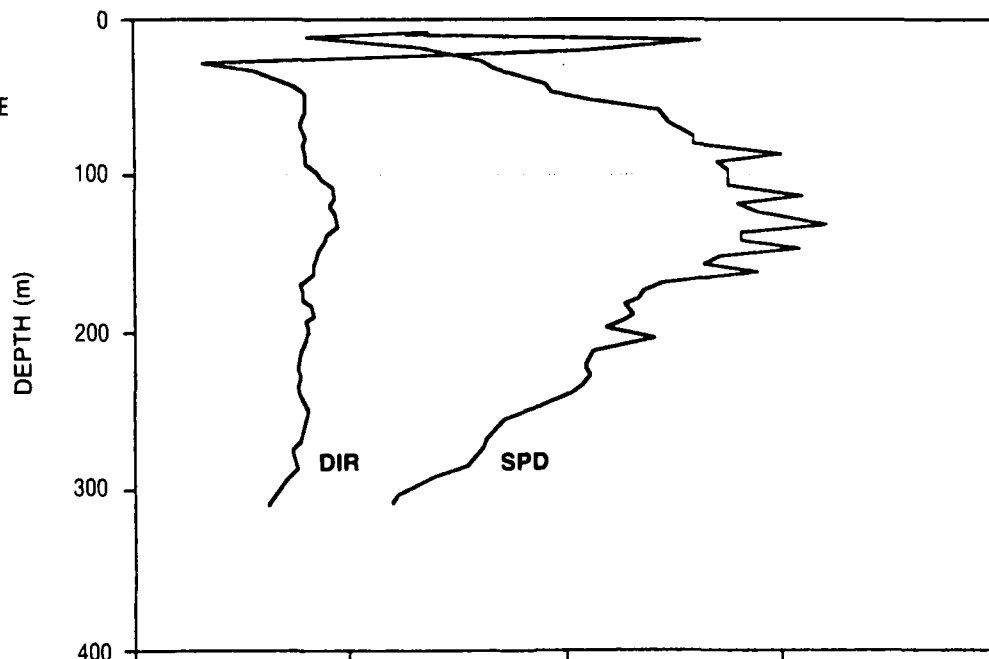


Figure 10. Current speed and direction profiles.

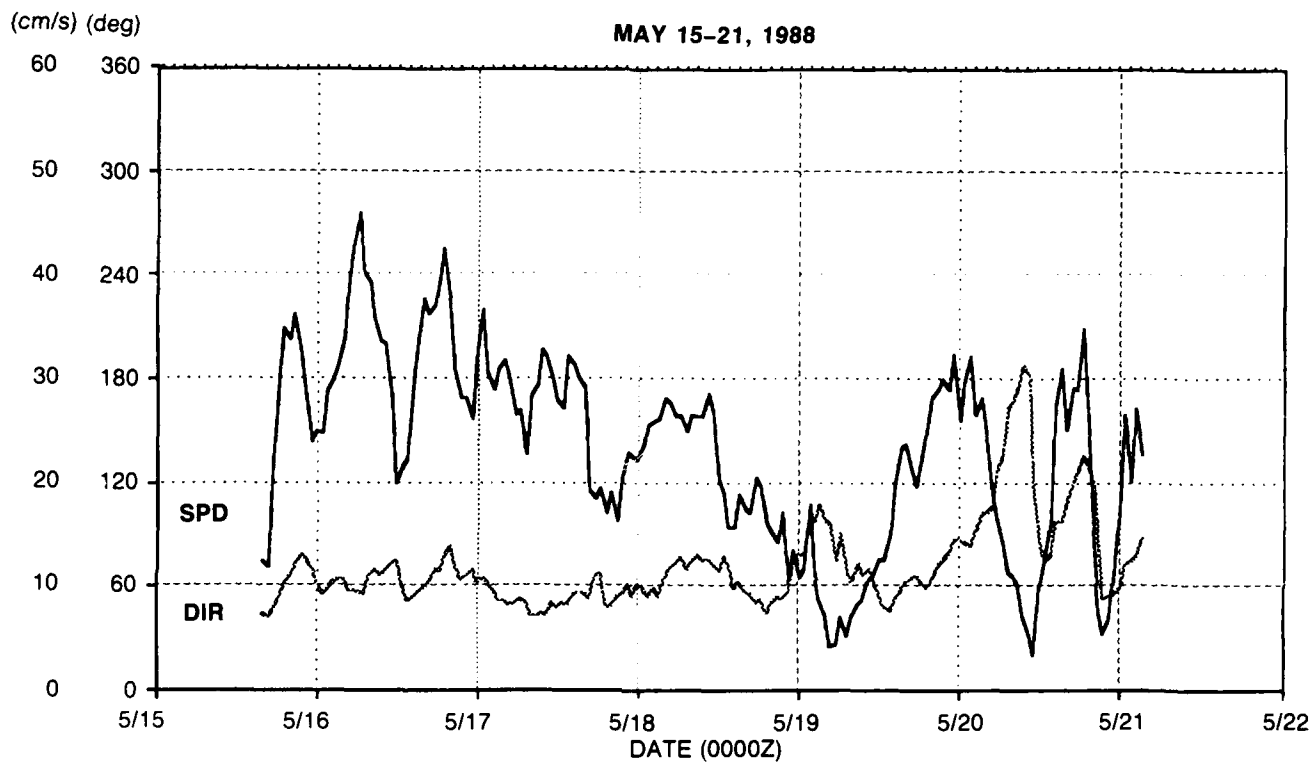


Figure 11. Current speed and direction time series.

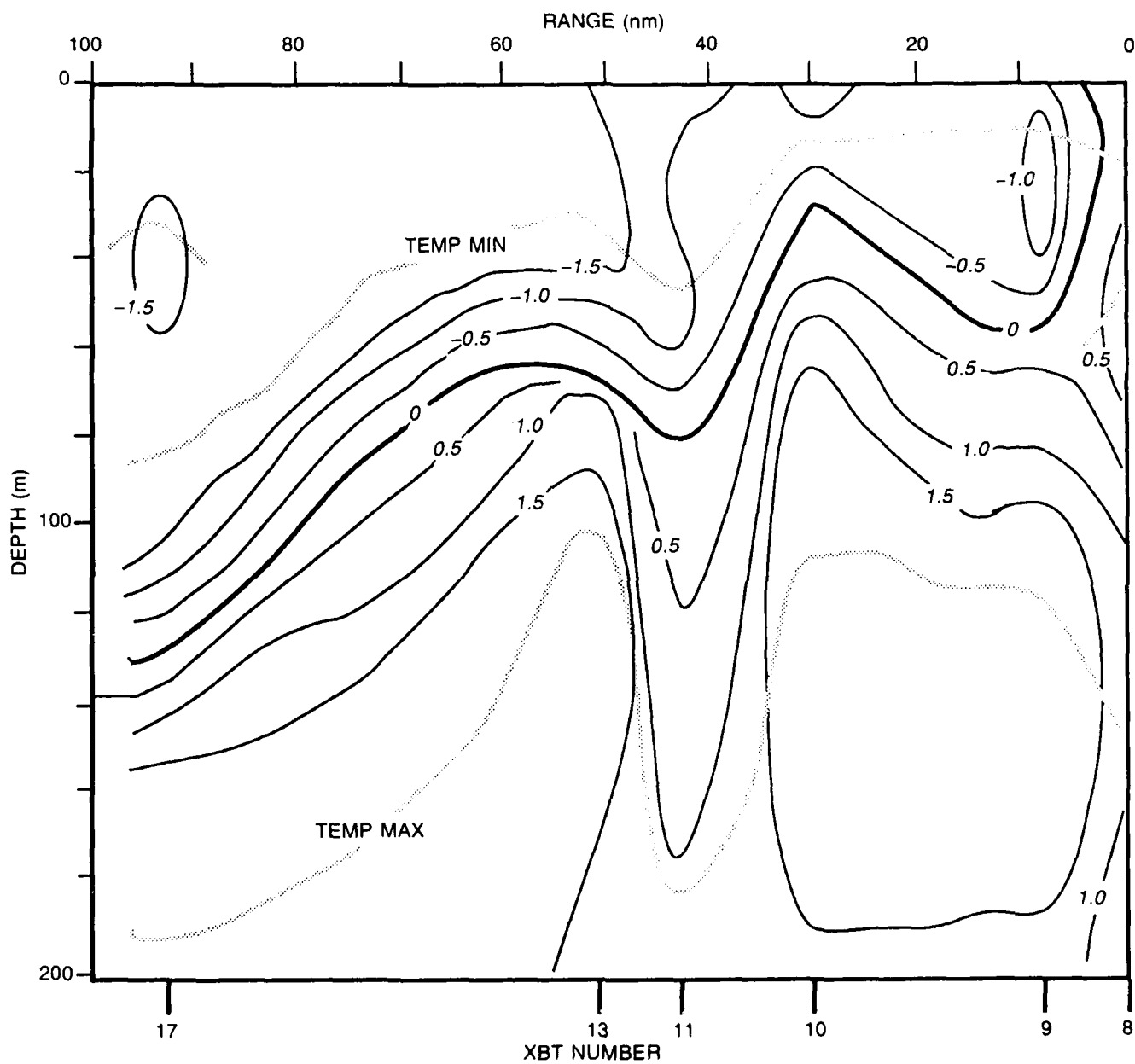


Figure 12. XBT temperature section during transit into ice pack.

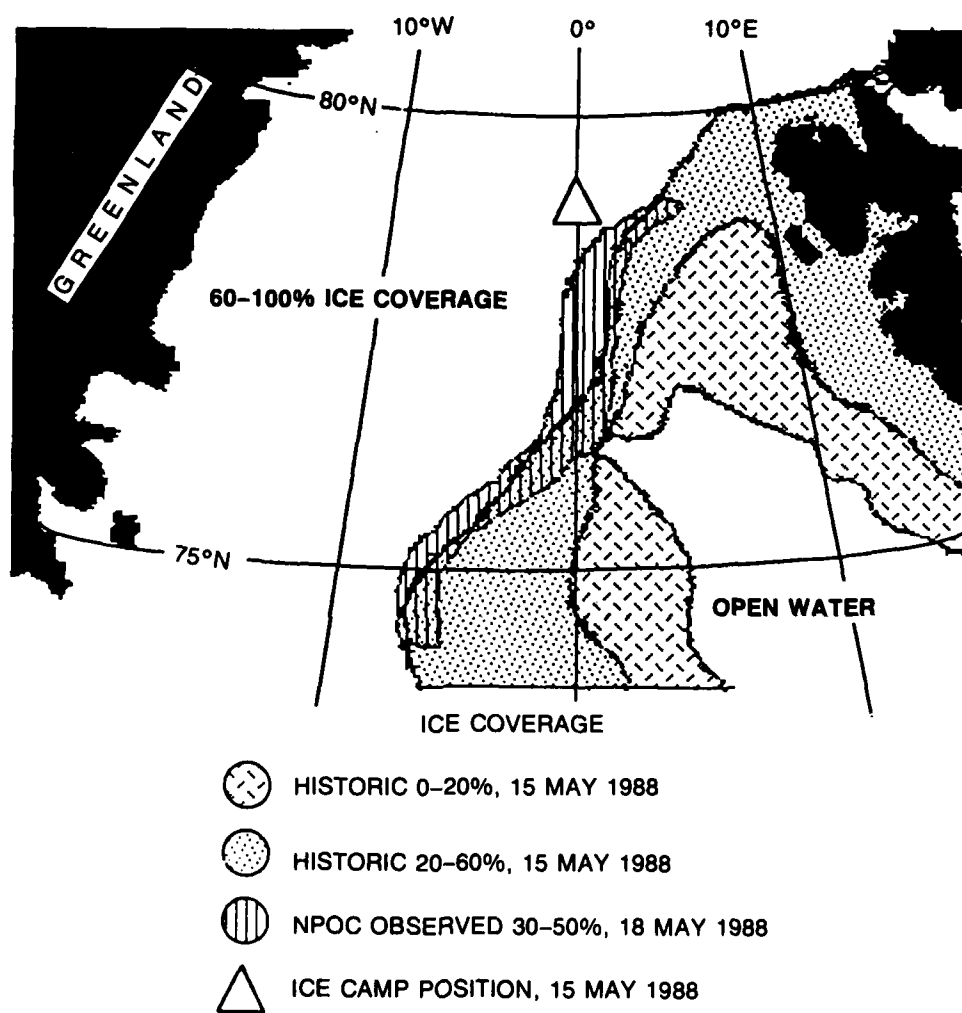


Figure 13. Ice edge observed and historical comparison.



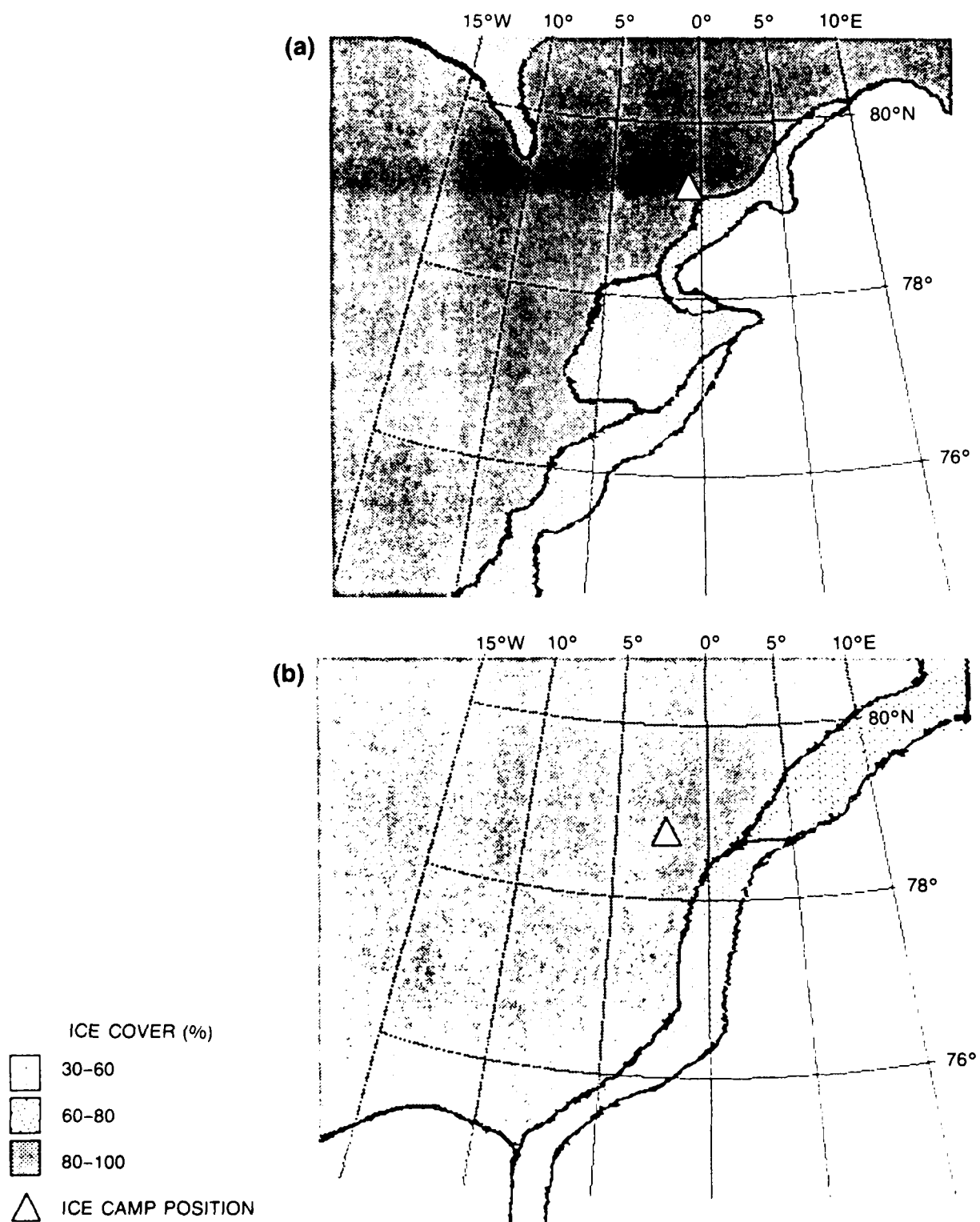


Figure 14. NPOC ice cover during experiment; (a) 11 May 1988 and (b) 18 May 1988.

# **Appendix A**

## **Navigation Tabulations**

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DATE/TIME	LATITUDE	LONGITUDE	DELTIME HRS	DIST N MILE	TOTAL N MILE	SPD KNOTS
05/14 11:00	79° 18.78'N	000° 08.80'E			0	
05/14 12:00	79° 17.81'N	000° 11.38'E	1	1.09	1.09	1.09
05/14 14:44	79° 17.25'N	000° 07.34'E	2.73	0.94	2.03	0.34
05/14 15:17	79° 17.04'N	000° 07.47'E	0.55	0.21	2.24	0.39
05/14 21:52	79° 15.72'N	000° 10.10'E	6.58	1.41	3.65	0.21
05/15 00:05	79° 13.10'N	000° 03.18'E	2.22	2.94	6.59	1.32
05/15 04:41	79° 12.46'N	000° 14.15'E	4.6	2.16	8.75	0.47
05/15 08:45	79° 13.95'N	000° 13.56'E	4.07	1.5	10.25	0.37
05/15 10:15	79° 13.48'N	000° 16.24'E	1.5	0.69	10.94	0.46
05/15 12:23	79° 12.39'N	000° 19.33'E	2.13	1.24	12.18	0.58
05/15 13:22	79° 07.73'N	000° 29.10'E	0.98	5.03	17.21	5.12
05/15 14:14	79° 11.67'N	000° 19.54'E	0.87	4.35	21.56	5.02
05/15 15:35	79° 11.13'N	000° 18.53'E	1.35	0.58	22.14	0.43
05/15 16:21	79° 10.53'N	000° 16.96'E	0.77	0.67	22.81	0.88
05/15 17:20	79° 00.45'N	000° 16.96'E	0.98	10.13	32.94	10.3
05/15 18:53	79° 09.64'N	000° 13.52'E	1.55	9.26	42.2	5.97
05/15 20:23	79° 09.07'N	000° 11.16'E	1.5	0.73	42.93	0.48
05/15 21:11	79° 09.01'N	000° 09.17'E	0.8	0.38	43.31	0.48
05/15 22:09	79° 08.61'N	000° 07.94'E	0.97	0.46	43.77	0.48
05/15 22:41	79° 08.24'N	000° 08.47'E	0.53	0.39	44.16	0.72
05/15 23:19	79° 08.35'N	000° 06.20'E	0.63	0.44	44.6	0.7
05/16 00:01	79° 08.08'N	000° 05.13'E	0.7	0.34	44.94	0.48
05/16 01:21	79° 07.53'N	000° 03.14'E	1.33	0.67	45.61	0.5
05/16 07:25	79° 06.11'N	000° 15.09'E	6.07	3.74	49.35	0.62
05/16 07:57	79° 05.88'N	000° 16.58'E	0.53	0.37	49.72	0.69
05/16 10:17	79° 05.12'N	000° 21.88'E	2.33	1.26	50.98	0.54
05/16 11:31	79° 05.03'N	000° 24.70'E	1.23	0.54	51.52	0.44
05/16 12:02	79° 03.98'N	000° 25.99'E	0.52	1.08	52.6	2.1
05/16 13:19	79° 04.26'N	000° 31.42'W	1.28	1.07	53.67	0.84
05/16 15:08	79° 03.60'N	000° 36.90'W	1.82	1.24	54.91	0.68
05/16 16:57	79° 02.98'N	000° 43.01'W	1.82	1.32	56.23	0.73
05/16 18:11	79° 02.39'N	000° 45.35'W	1.23	0.74	56.97	0.6
05/16 19:46	79° 02.00'N	000° 52.43'W	1.58	1.41	58.38	0.89
05/16 21:10	79° 01.41'N	000° 55.06'W	1.4	0.78	59.16	0.56
05/16 23:01	79° 00.63'N	000° 59.90'W	1.85	1.21	60.37	0.66
05/16 23:18	79° 00.55'N	001° 00.41'W	0.28	0.13	60.5	0.45
05/16 23:53	79° 00.08'N	001° 01.01'W	0.58	0.49	60.99	0.83
05/17 00:14	79° 00.08'N	001° 01.01'W	0.35	0	60.99	0
05/17 06:13	78° 58.41'N	001° 18.42'W	5.98	3.74	64.73	0.63
05/17 07:19	78° 58.04'N	001° 00.94'W	1.1	3.38	68.11	3.07
05/17 08:01	78° 57.78'N	001° 23.02'W	0.7	4.26	72.37	6.08
05/17 09:09	78° 57.49'N	001° 26.01'W	1.13	0.65	73.02	0.57
05/17 09:49	78° 57.06'N	001° 27.21'W	0.67	0.49	73.51	0.73
05/17 11:33	78° 56.40'N	001° 30.77'W	1.73	0.95	74.46	0.55
05/17 12:11	78° 56.36'N	001° 32.77'W	0.63	0.39	74.85	0.61
05/17 14:01	78° 55.66'N	001° 36.54'W	1.83	1.01	75.86	0.55
05/17 15:51	78° 55.08'N	001° 40.21'W	1.83	0.92	76.78	0.5
05/17 17:07	78° 54.70'N	001° 40.03'W	1.27	0.38	77.16	0.3
05/17 18:01	78° 54.46'N	001° 43.24'W	0.9	0.67	77.83	0.74
05/17 19:27	78° 53.81'N	001° 44.62'W	1.43	0.71	78.54	0.49
05/17 22:08	78° 52.74'N	001° 48.72'W	2.68	1.34	79.88	0.5
05/18 00:21	78° 51.96'N	001° 53.80'W	2.22	1.26	81.14	0.57
05/18 01:31	78° 51.55'N	001° 55.00'W	1.17	0.47	81.61	0.41
05/18 02:11	78° 51.36'N	001° 57.48'W	0.67	0.52	82.13	0.78

DATE/TIME	LATITUDE	LONGITUDE	DELTIME	DIST	TOTAL	SPD
			HRS	N MILE	N MILE	KNOTS
05/18 07:00	78° 50.28'N	002° 06.96'W	4.82	2.14	84.27	0.44
05/18 07:37	78° 49.96'N	002° 09.05'W	0.62	0.52	84.79	0.84
05/18 09:53	78° 49.48'N	002° 15.50'W	2.27	1.35	86.14	0.59
05/18 11:19	78° 48.70'N	002° 19.11'W	1.43	1.05	87.19	0.73
05/18 11:43	78° 48.73'N	002° 20.32'W	0.4	0.24	87.43	0.59
05/18 13:33	78° 47.94'N	002° 25.22'W	1.83	1.24	88.67	0.68
05/18 14:47	78° 47.45'N	002° 28.67'W	1.23	0.83	89.5	0.68
05/18 15:23	78° 47.28'N	002° 30.52'W	0.6	0.4	89.9	0.67
05/18 15:51	78° 47.31'N	002° 31.04'W	0.47	0.11	90.01	0.23
05/18 19:00	78° 45.92'N	002° 37.96'W	3.15	1.95	91.96	0.62
05/18 19:12	78° 45.35'N	002° 32.75'W	0.2	1.17	93.13	5.85
05/18 20:17	78° 45.59'N	002° 42.27'W	1.08	1.88	95.01	1.74
05/18 22:09	78° 44.70'N	002° 47.05'W	1.87	1.3	96.31	0.69
05/18 23:12	78° 44.01'N	002° 44.78'W	1.05	0.82	97.13	0.78
05/19 00:03	78° 43.91'N	002° 52.51'W	0.85	1.52	98.65	1.79
05/19 00:23	78° 43.59'N	002° 53.94'W	0.33	0.43	99.08	1.28
05/19 01:49	78° 43.37'N	002° 58.53'W	1.43	0.93	100.01	0.65
05/19 03:39	78° 43.31'N	002° 59.94'W	1.83	0.28	100.29	0.15
05/19 08:00	78° 41.80'N	003° 11.44'W	4.35	2.72	103.01	0.63
05/19 09:53	78° 41.16'N	003° 13.20'W	1.88	0.73	103.74	0.39
05/19 12:37	78° 38.83'N	003° 20.10'W	2.73	2.71	106.45	0.99
05/19 14:26	78° 37.44'N	003° 24.15'W	1.82	1.61	108.06	0.89
05/19 17:19	78° 35.18'N	003° 32.13'W	2.88	2.77	110.83	0.96
05/19 18:10	78° 34.09'N	003° 34.58'W	0.85	1.2	112.03	1.41
05/19 19:09	78° 33.01'N	003° 48.43'W	0.98	2.97	115	3.02
05/19 19:54	78° 33.77'N	003° 39.16'W	0.75	2	117	2.67
05/19 21:00	78° 32.73'N	003° 43.52'W	1.1	1.36	118.36	1.24
05/19 22:49	78° 31.52'N	003° 47.95'W	1.82	1.5	119.86	0.83
05/20 00:00	78° 30.45'N	003° 51.26'W	1.18	1.26	121.12	1.07
05/20 01:25	78° 29.63'N	003° 56.40'W	1.42	1.32	122.44	0.93
05/20 01:43	78° 29.41'N	003° 57.24'W	0.3	0.28	122.72	0.93
05/20 03:31	78° 28.92'N	004° 02.07'W	1.8	1.09	123.81	0.6
05/20 03:56	78° 28.63'N	004° 02.81'W	0.42	0.33	124.14	0.78
05/20 05:57	78° 28.86'N	004° 06.99'W	2.02	0.87	125.01	0.43
05/20 07:05	78° 29.13'N	004° 07.80'W	1.13	0.32	125.33	0.28
05/20 07:41	78° 29.07'N	004° 08.33'W	0.6	0.12	125.45	0.2
05/20 08:45	78° 29.00'N	004° 08.17'W	1.07	0.08	125.53	0.07
05/20 08:56	78° 29.05'N	004° 08.57'W	0.18	0.09	125.62	0.52
05/20 09:51	78° 28.90'N	004° 08.71'W	0.92	0.15	125.77	0.17
05/20 11:19	78° 28.56'N	004° 10.49'W	1.47	0.49	126.26	0.34
05/20 17:47	78° 27.72'N	004° 27.86'W	6.47	3.59	129.85	0.56
05/20 19:37	78° 27.96'N	004° 31.85'W	1.83	0.84	130.69	0.46
05/20 23:31	78° 25.76'N	004° 36.75'W	3.9	2.42	133.11	0.62
05/21 01:20	78° 26.08'N	004° 40.46'W	22.48	0.81	133.92	0.04

# Appendix B

## Surface Wind Tabulations

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Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/21/88 00:16	18.02	201	21.42	197
05/21/88 00:01	17.92	205.4	20.45	203.4
05/20/88 23:46	17.2	202.8	20.32	204.8
05/20/88 23:31	18.32	204.2	21.97	202.2
05/20/88 23:16	18.27	212.6	23.07	211.6
05/20/88 23:01	18.35	215	21.5	213
05/20/88 22:46	17.45	217.4	20.9	220.4
05/20/88 22:31	18.02	217.8	20.15	210.8
05/20/88 22:16	16.45	218.2	20.15	212.2
05/20/88 22:01	16.77	219.6	20.17	222.6
05/20/88 21:46	17.67	228	20.67	230
05/20/88 21:31	17.92	227.4	20.92	228.4
05/20/88 21:16	17.17	227.8	21.22	226.8
05/20/88 21:01	17.92	228.2	21.22	227.2
05/20/88 20:46	18	230.6	22.2	228.6
05/20/88 20:31	17.65	231	19.82	229
05/20/88 20:16	17.12	234.4	19.55	233.4
05/20/88 20:01	17.57	238.8	20.47	238.8
05/20/88 19:46	17.2	242.2	19.97	241.2
05/20/88 19:31	17.12	241.6	20.32	238.6
05/20/88 19:16	17.42	244	21.42	246
05/20/88 19:01	17.4	246.4	20.62	245.4
05/20/88 18:46	16.37	247.8	18.32	252.8
05/20/88 18:31	17.32	255.2	22	262.2
05/20/88 18:16	18.2	256.6	21.67	263.6
05/20/88 18:01	17.7	259	21.8	263
05/20/88 17:46	17.32	262.4	21.05	264.4
05/20/88 17:31	16.75	262.8	19.3	266.8
05/20/88 17:16	15.67	268.2	19.45	264.2
05/20/88 17:01	16.15	269.6	18.87	268.6
05/20/88 16:46	15.47	272	18.2	270
05/20/88 16:31	14.55	273.4	16.92	274.4
05/20/88 16:16	15.9	277.8	18.07	273.8
05/20/88 16:01	14.95	278.2	18	275.2
05/20/88 15:46	15.02	281.6	18.77	282.6
05/20/88 15:31	15.55	286	18.25	288
05/20/88 15:16	15.27	287.4	19.12	284.4
05/20/88 15:01	15	290.8	16.92	287.8
05/20/88 14:46	15.15	294.2	17.6	293.2
05/20/88 14:31	16.52	297.6	18.95	295.6
05/20/88 14:16	14.15	303	17.07	309
05/20/88 14:01	15.2	305.4	16.82	308.4
05/20/88 13:46	14.12	307.8	16.82	313.8
05/20/88 13:31	12.8	315.2	16.25	317.2
05/20/88 13:16	14.47	-19.4	16.57	-41.4
05/20/88 13:01	14.17	-30	16.85	-38
05/20/88 12:46	13.77	-12.6	15.57	68.4
05/20/88 12:31	14.77	-30.2	17.45	-36.2
05/20/88 12:16	14.42	-24.8	16.87	-34.8
05/20/88 12:01	14.85	-21.4	17.77	-25.4
05/20/88 11:46	15.42	-28	16.95	-28
05/20/88 11:31	14.72	-26.6	17	-28.6
05/20/88 11:16	14.17	-18.2	17.42	329.8
05/20/88 11:01	13.72	-20	17.2	-22
05/20/88 10:46	13.42	-23.144	16.12	-19.144
05/20/88 10:31	11.9	-17.288	13.95	326.712
05/20/88 10:16	10.85	-25.432	13.75	-27.432
05/20/88 10:01	10.37	-13.576	11.8	-13.576
05/20/88 09:46	9.45	-6.72	11.37	-5.72
05/20/88 09:31	8.37	-6.864	10.05	-4.864
05/20/88 09:16	7.25	2.992	9.1	-1.008
05/20/88 09:01	8.92	22.848	11.5	24.848
05/20/88 08:46	8.72	25.704	11.32	25.704
05/20/88 08:31	10.75	27.56	13.65	28.56
05/20/88 08:16	10.15	29.416	13.32	36.416
05/20/88 08:01	10.62	29.272	12.52	31.272
05/20/88 07:46	11.25	26.128	13.52	29.128
05/20/88 07:31	9.65	29.984	11.32	25.984
05/20/88 07:16	9.2	29.84	12.3	28.84
05/20/88 07:01	10.6	30.696	14.72	39.696

Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/20/88 06:46	8.75	26.552	10.47	23.552
05/20/88 06:31	7.75	28.408	10.25	32.408
05/20/88 06:16	7.17	25.264	9.57	23.264
05/20/88 06:01	5.75	9.12	6.77	1.12
05/20/88 05:46	6.52	5.976	7.07	5.976
05/20/88 05:31	5.95	-2.168	7.02	0.832
05/20/88 05:16	7.02	4.688	8.1	10.688
05/20/88 05:01	7.85	4.544	9	-0.456
05/20/88 04:46	9.22	2.4	10.67	1.4
05/20/88 04:31	8.75	0.256	10.3	-0.744
05/20/88 04:16	10.27	3.112	11.6	-1.888
05/20/88 04:01	9.82	-4.032	11.85	2.968
05/20/88 03:46	9.52	-5.176	10.7	2.824
05/20/88 03:31	11.1	-4.32	13.6	-5.32
05/20/88 03:16	12.1	-7.464	15.07	-7.464
05/20/88 03:01	13.07	-10.608	16.55	-15.608
05/20/88 02:46	15.22	-9.752	18.02	-8.752
05/20/88 02:31	15.87	-12.896	20.75	-7.896
05/20/88 02:16	15.97	-16.04	19.5	-16.04
05/20/88 02:01	19.5	-15.184	24.32	-21.184
05/20/88 01:46	19.5	-16.328	23.7	-18.328
05/20/88 01:31	19.32	-16.472	21.5	-20.472
05/20/88 01:16	21.77	-17.616	24.85	-13.616
05/20/88 01:01	22.6	-19.76	26.97	-28.76
05/20/88 00:46	22.05	-21.904	25.72	-14.904
05/20/88 00:31	20.4	-25.048	23.57	-30.048
05/20/88 00:16	20.15	-25.192	25.02	-22.192
05/20/88 00:01	21.05	-27.336	24.52	-29.336
05/19/88 23:46	21.25	-27.48	25.37	-22.48
05/19/88 23:31	19.82	-23.624	23.45	-21.624
05/19/88 23:16	18.67	-29.768	20.45	-27.768
05/19/88 23:01	20.02	-25.912	22.9	-22.912
05/19/88 22:46	21.6	-26.056	26.5	-24.056
05/19/88 22:31	20.72	-26.2	25.3	-29.2
05/19/88 22:16	22.17	-24.344	30.4	-18.344
05/19/88 22:01	19.67	-23.488	22.87	-21.488
05/19/88 21:46	22.2	-22.632	26.05	-23.632
05/19/88 21:31	21.67	-21.776	26.57	-17.776
05/19/88 21:16	22.72	-21.92	26.4	-19.92
05/19/88 21:01	20.8	-18.064	26.42	-27.064
05/19/88 20:46	20.7	-19.208	24.72	-22.208
05/19/88 20:31	20	-17.352	25.55	-17.352
05/19/88 20:16	21.97	-14.496	25.75	-11.496
05/19/88 20:01	20.97	-7.64	25.72	-8.64
05/19/88 19:46	20.35	-4.784	25.65	-3.784
05/19/88 19:31	20.35	-4.928	23.65	1.072
05/19/88 19:16	20.8	-3.072	26	-18.072
05/19/88 19:01	20.37	-6.216	27.5	-0.216
05/19/88 18:46	21.05	-4.36	26.42	-1.36
05/19/88 18:31	20.07	-5.504	24.35	1.496
05/19/88 18:16	20.97	-4.648	26.77	-5.648
05/19/88 18:01	19.52	-5.792	21.8	-3.792
05/19/88 17:46	20.22	-3.936	23.8	-1.936
05/19/88 17:31	20.9	-0.08	25.75	2.92
05/19/88 17:16	21.9	1.776	25.9	2.776
05/19/88 17:01	20.22	4.632	23.5	0.632
05/19/88 16:46	19.75	3.488	24.85	1.488
05/19/88 16:31	19.02	9.344	24.17	5.344
05/19/88 16:16	19.85	9.2	24.45	12.2
05/19/88 16:01	20.17	13.056	24.3	16.056
05/19/88 15:46	19.77	15.912	22.15	18.912
05/19/88 15:31	20.2	17.768	23.67	15.768
05/19/88 15:16	18.32	15.624	22.45	6.624
05/19/88 15:01	18.75	16.48	22.12	24.48
05/19/88 14:46	19.85	11.336	23.72	4.336
05/19/88 14:31	17.85	13.192	22.07	10.192
05/19/88 14:16	18.52	16.048	21.72	10.048
05/19/88 14:01	17.65	23.904	23.8	20.904
05/19/88 13:46	16.95	8.76	21.57	6.76
05/19/88 13:31	16.82	13.616	20.37	13.616

Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/19/88 13:16	14.97	24.472	20.25	29.472
05/19/88 13:01	15.9	25.328	20.77	19.328
05/19/88 12:46	14.4	13.184	18.6	25.184
05/19/88 12:31	13.5	13.04	17.4	6.04
05/19/88 12:16	13.17	17.896	15.8	14.896
05/19/88 12:01	12.15	31.752	16.32	40.752
05/19/88 11:46	14.05	8.608	16.5	7.608
05/19/88 11:31	14.1	14.464	17.35	12.464
05/19/88 11:16	13.72	18.32	17	14.32
05/19/88 11:01	14.82	24.176	16.62	24.176
05/19/88 10:46	13.7	27	16.22	27
05/19/88 10:31	13.4	22.29	17.72	19.29
05/19/88 10:16	13.85	20.58	15.87	17.58
05/19/88 10:01	13.45	18.87	16.4	13.87
05/19/88 09:46	12.45	14.16	14.82	19.16
05/19/88 09:31	11.8	12.45	14.92	7.45
05/19/88 09:16	11.92	8.74	14.35	6.74
05/19/88 09:01	12.25	13.03	15.17	19.03
05/19/88 08:46	12.8	12	16.57	12
05/19/88 08:31	10.6	10.573	13.12	10.573
05/19/88 08:16	11.42	10.146	14.35	13.146
05/19/88 08:01	12.47	7.719	14.45	9.719
05/19/88 07:46	12.07	6.292	14.37	7.292
05/19/88 07:31	11.47	9.865	14.45	19.865
05/19/88 07:16	11.65	4.438	13.55	4.438
05/19/88 07:01	12.17	3.011	13.45	4.011
05/19/88 06:46	11.95	3.584	14.2	2.584
05/19/88 06:31	10.25	6.157	12.4	2.157
05/19/88 06:16	10.35	3.73	12.17	2.73
05/19/88 06:01	10.35	4.303	13.22	4.303
05/19/88 05:46	8.4	15.876	11.5	22.876
05/19/88 05:31	8.77	17.449	11.82	23.449
05/19/88 05:16	11.02	25.022	12.52	22.022
05/19/88 05:01	11.75	30.595	13.15	30.595
05/19/88 04:46	10.2	22.168	12.77	13.168
05/19/88 04:31	10.72	20.741	13.15	11.741
05/19/88 04:16	11.5	23.314	12.75	30.314
05/19/88 04:01	12.77	10.887	15.22	7.887
05/19/88 03:46	12.52	12.46	16.32	8.46
05/19/88 03:31	12.5	15.033	15.52	14.033
05/19/88 03:16	12.95	16.606	15.32	13.606
05/19/88 03:01	12.52	13.179	14.45	18.179
05/19/88 02:46	11.37	17.752	15.95	10.752
05/19/88 02:31	11.75	27.325	15.4	27.325
05/19/88 02:16	13.42	18.898	16.77	18.898
05/19/88 02:01	14.22	20.471	16.97	19.471
05/19/88 01:46	13.62	21.044	16	19.044
05/19/88 01:31	14.87	17.617	16.95	22.617
05/19/88 01:16	15.57	12.19	18.7	11.19
05/19/88 01:01	13.62	9.763	16.2	3.763
05/19/88 00:46	14.97	13.336	17.8	9.336
05/19/88 00:31	16.37	1.909	19.65	-1.091
05/19/88 00:16	16.3	2.482	19.5	2.482
05/19/88 00:01	15.75	2.055	18.2	-4.945
05/18/88 23:46	16.77	-2.372	19.15	-5.372
05/18/88 23:31	16.35	-1.799	18.67	-5.799
05/18/88 23:16	16.1	-10.226	18.57	-8.226
05/18/88 23:01	16.8	-8.653	19.57	-4.653
05/18/88 22:46	16.72	-10.08	20.05	-7.08
05/18/88 22:31	17.9	-8.507	20.4	-15.507
05/18/88 22:16	18.15	-9.934	20.62	-14.934
05/18/88 22:01	17.8	-16.361	22.4	-13.361
05/18/88 21:46	17.25	-16.788	21.5	-14.788
05/18/88 21:31	17.65	-21.215	21.65	-16.215
05/18/88 21:16	17.67	-23.642	21.45	-19.642
05/18/88 21:01	16.8	-23.069	20.27	-30.069
05/18/88 20:46	16.62	-21.496	20.87	-10.496
05/18/88 20:31	18.42	-22.923	20.8	-24.923
05/18/88 20:16	16.3	-27.35	19.82	-24.35
05/18/88 20:01	17.5	-25.777	19.9	-27.777

Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/18/88 19:46	17.35	-27.204	20.55	-28.204
05/18/88 19:31	18.57	-25.631	21.37	-35.631
05/18/88 19:16	17.87	-28.058	20.4	-33.058
05/18/88 19:01	17.32	-27.85	20.1	-32.485
05/18/88 18:46	17.85	-33.912	20.45	-28.912
05/18/88 18:31	19.15	-32.339	21.52	-29.339
05/18/88 18:16	19.5	-34.766	21.25	-30.766
05/18/88 18:01	17.97	-18.193	20.7	-35.193
05/18/88 17:46	16.7	-15.62	19.57	-27.62
05/18/88 17:31	16.52	324.953	19.65	-30.047
05/18/88 17:16	18.1	-26.474	20.42	322.526
05/18/88 17:01	16.9	-29.901	21.6	-29.901
05/18/88 16:46	18.05	-27.328	21.12	326.672
05/18/88 16:31	16.7	-10.755	19.9	-28.755
05/18/88 16:16	15.9	327.818	18.67	189.818
05/18/88 16:01	14.62	328.391	19.45	-29.609
05/18/88 15:46	13.15	-25.036	16.77	-23.036
05/18/88 15:31	13.55	-23.463	15.77	-18.463
05/18/88 15:16	11.95	-15.89	14.2	-18.89
05/18/88 15:01	13.4	-6.317	16.2	-10.317
05/18/88 14:46	15.1	-7.744	17.5	-14.744
05/18/88 14:31	15.07	-14.171	18.57	-17.171
05/18/88 14:16	15.4	-15.598	18.75	-13.598
05/18/88 14:01	16.77	-17.025	19.25	-15.025
05/18/88 13:46	15.82	-24.452	18.87	-16.452
05/18/88 13:31	16.4	295.121	19.02	252.121
05/18/88 13:16	16.02	334.694	18.67	-14.306
05/18/88 13:01	16.9	335.267	19.22	229.267
05/18/88 12:46	17.4	-19.16	20.45	-23.16
05/18/88 12:31	17	-5.587	20.7	-20.587
05/18/88 12:16	17.32	336.986	20.75	-17.014
05/18/88 12:01	16.47	-15	19.15	332
05/18/88 11:46	18.5	304.664	21.42	330.664
05/18/88 11:31	19.25	332.328	23.02	337.328
05/18/88 11:16	17.02	335.992	20.12	-9.008
05/18/88 11:01	18.35	331.656	23.12	336.656
05/18/88 10:46	18.55	329.32	21.92	-20.68
05/18/88 10:31	18.77	333.984	21.25	334.984
05/18/88 10:16	17.9	325.648	19.87	327.648
05/18/88 10:01	19.9	324.312	22.85	330.312
05/18/88 09:46	19.9	325.976	23.82	332.976
05/18/88 09:31	18.17	322.64	22.62	330.64
05/18/88 09:16	17.47	333.304	21.47	334.304
05/18/88 09:01	16.9	322.968	21.32	327.968
05/18/88 08:46	17.85	312.632	21.27	54.632
05/18/88 08:31	15.6	-21.704	19.62	190.296
05/18/88 08:16	17.27	330.96	20.37	330.96
05/18/88 08:01	17.6	-25.376	21.45	-26.376
05/18/88 07:46	16.35	330.288	19.2	332.288
05/18/88 07:31	16.2	330.952	20.47	-19.048
05/18/88 07:16	17.67	328.616	21	328.616
05/18/88 07:01	17.5	327.28	21.87	323.28
05/18/88 06:46	17.52	-1.056	20.12	327.944
05/18/88 06:31	18.42	326.608	22.42	324.608
05/18/88 06:16	19.77	329.272	24.3	-25.728
05/18/88 06:01	18.62	320.936	21.45	323.936
05/18/88 05:46	19.1	319.6	22.85	316.6
05/18/88 05:31	18.35	322.264	21.72	324.264
05/18/88 05:16	16.82	314.928	21.17	320.928
05/18/88 05:01	19.87	319.592	21.97	327.592
05/18/88 04:46	19.62	321.256	25.52	201.256
05/18/88 04:31	19.35	322.92	22.27	326.92
05/18/88 04:16	18.1	323.584	21.82	321.584
05/18/88 04:01	18.77	320.248	25.22	322.248
05/18/88 03:46	17.72	320.912	22.17	322.912
05/18/88 03:31	17.2	318.576	20.57	325.576
05/18/88 03:16	16.7	317.24	20.9	315.24
05/18/88 03:01	17.57	315.904	22.77	137.904
05/18/88 02:46	18	316.568	22.35	316.568
05/18/88 02:31	18.45	315.232	22.45	313.232

Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/18/88 02:16	19.27	316.896	25.22	321.896
05/18/88 02:01	20.07	315.56	22.57	310.56
05/18/88 01:46	17.95	318.224	20.87	323.224
05/18/88 01:31	17.82	311.888	21.67	316.888
05/18/88 01:16	16.7	310.552	21.55	314.552
05/18/88 01:01	19.22	312.216	22.05	317.216
05/18/88 00:46	18.92	317.88	24.12	168.88
05/18/88 00:31	18.4	308.544	22.5	322.544
05/18/88 00:16	17.6	306.208	20.57	309.208
05/18/88 00:01	18.07	313.872	22.2	312.872
05/17/88 23:46	17.77	303.536	21.1	301.536
05/17/88 23:31	17.87	297.2	22.1	296.2
05/17/88 23:16	19.32	300.864	25.15	307.864
05/17/88 23:01	16.8	306.528	21.15	308.528
05/17/88 22:46	17.8	306.192	23.35	313.192
05/17/88 22:31	15.5	304.856	18.4	310.856
05/17/88 22:16	18.3	303.52	21.3	308.52
05/17/88 22:01	18.5	296.184	21.27	297.184
05/17/88 21:46	17.65	293.848	22.22	286.848
05/17/88 21:31	16.32	295.512	20.95	290.512
05/17/88 21:16	18.77	296.176	27.6	296.176
05/17/88 21:01	18.82	291.84	22.2	288.84
05/17/88 20:46	18.42	288.504	20.72	288.504
05/17/88 20:31	17.57	292.168	21.95	303.168
05/17/88 20:16	19.32	285.832	21.97	282.832
05/17/88 20:01	19.57	283.496	23.72	283.496
05/17/88 19:46	20.85	283.16	23.52	279.16
05/17/88 19:31	19.57	288.824	22.77	284.824
05/17/88 19:16	19.57	287.488	25.35	286.488
05/17/88 19:01	19.82	286.152	24.42	276.152
05/17/88 18:46	19.12	284.816	22.05	281.816
05/17/88 18:31	21.25	277.48	24.17	280.48
05/17/88 18:16	19.22	280.144	23.62	271.144
05/17/88 18:01	18.5	279.808	22.97	292.808
05/17/88 17:46	18.25	278.472	22.27	269.472
05/17/88 17:31	19.22	277.136	23.47	267.136
05/17/88 17:16	19.77	272.8	22.95	271.8
05/17/88 17:01	19.32	281.464	22.32	274.464
05/17/88 16:46	19.35	276.128	22.85	270.128
05/17/88 16:31	18.17	271.792	21.92	268.792
05/17/88 16:16	18.9	276.456	21	274.456
05/17/88 16:01	18.07	269.12	21.42	263.12
05/17/88 15:46	18.27	271.784	23.7	265.784
05/17/88 15:31	19.67	271.448	21.97	266.448
05/17/88 15:16	20.47	269.112	24.2	275.112
05/17/88 15:01	20.52	272.776	23.12	271.776
05/17/88 14:46	19.57	270.44	21.9	269.44
05/17/88 14:31	20.87	263.104	25.67	263.104
05/17/88 14:16	20	267.768	23.65	260.768
05/17/88 14:01	19.4	263.432	22.72	256.432
05/17/88 13:46	19.97	262.096	22.65	267.096
05/17/88 13:31	18.77	258.76	21.52	258.76
05/17/88 13:16	18.45	256.424	21.5	247.424
05/17/88 13:01	19.05	254.088	23.27	247.088
05/17/88 12:46	18.97	254.752	21.95	247.752
05/17/88 12:31	19.05	258.416	23.42	251.416
05/17/88 12:16	20.5	257.08	23.5	254.08
05/17/88 12:01	20.2	260.744	23.02	262.744
05/17/88 11:46	19.3	257.408	24.2	262.408
05/17/88 11:31	17.87	259.072	19.62	258.072
05/17/88 11:16	19	251.736	22.8	252.736
05/17/88 11:01	18.02	245.4	21.77	247.4
05/17/88 10:46	18	250.064	20.65	244.064
05/17/88 10:31	18.22	250.728	21.72	242.728
05/17/88 10:16	19.32	245.392	21.62	253.392
05/17/88 10:01	17.52	245.056	20.02	247.056
05/17/88 09:46	17.52	255.72	20.9	253.72
05/17/88 09:31	17.52	257.384	20.5	261.384
05/17/88 09:16	19.72	258.048	23.85	243.048
05/17/88 09:01	19.22	266.712	21.6	263.712

Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/17/88 08:46	19.22	263.376	22.95	254.376
05/17/88 08:31	18.37	259.04	21.82	268.04
05/17/88 08:16	18.75	260.704	21.87	262.704
05/17/88 08:01	20	262.368	24.65	254.368
05/17/88 07:46	19.9	264.032	23.25	260.032
05/17/88 07:31	19.15	259.696	22.4	259.696
05/17/88 07:16	19.17	263.36	22.92	256.36
05/17/88 07:01	18.6	264.024	23.65	266.024
05/17/88 06:46	17.65	265	19.97	261
05/17/88 06:31	16.9	268.937	19.9	271.937
05/17/88 06:16	17.05	271.874	22.97	263.874
05/17/88 06:01	18.95	274.811	22.32	274.811
05/17/88 05:46	16.87	280.748	19.1	283.748
05/17/88 05:31	18.27	281.685	21.45	283.685
05/17/88 05:16	18.12	281.622	21.52	276.622
05/17/88 05:01	16.82	283.559	20.57	276.559
05/17/88 04:46	17.02	280.496	21	265.496
05/17/88 04:31	18.77	286.433	21.82	284.433
05/17/88 04:16	17.3	287.37	21.25	288.37
05/17/88 04:01	21.5	272.307	26.12	264.307
05/17/88 03:46	21.15	274.244	26.07	265.244
05/17/88 03:31	20.6	278.181	24.17	279.181
05/17/88 03:16	21.4	284.118	27.77	279.118
05/17/88 03:01	19.77	285.055	24.75	276.055
05/17/88 02:46	21.85	275.992	24.67	277.992
05/17/88 02:31	22.77	276.929	26.47	278.929
05/17/88 02:16	23.92	281.866	27.27	278.866
05/17/88 02:01	22.02	285.803	27.07	283.803
05/17/88 01:46	24.22	287.74	28.97	282.74
05/17/88 01:31	22.65	282.677	26.67	284.677
05/17/88 01:16	22.57	288.614	26.7	289.614
05/17/88 01:01	21.02	289.551	24.92	285.551
05/17/88 00:46	22.77	287.488	25.25	290.488
05/17/88 00:31	20.05	296.425	29.15	290.425
05/17/88 00:16	23.42	295.362	28.55	286.362
05/17/88 00:01	24.2	297.299	29.05	289.299
05/16/88 23:46	21.92	306.236	28.37	301.236
05/16/88 23:31	21.62	306.173	25.07	310.173
05/16/88 23:16	19.07	306.11	24.42	305.11
05/16/88 23:01	21.82	307.047	25.7	313.047
05/16/88 22:46	20.95	309.984	26.85	296.984
05/16/88 22:31	22.4	312.921	27.82	312.921
05/16/88 22:16	22.65	313.858	26.95	310.858
05/16/88 22:01	24.2	311.795	30.32	306.795
05/16/88 21:46	21.32	311.732	26.07	318.732
05/16/88 21:31	21.15	311.669	26.8	321.669
05/16/88 21:16	23.57	317.606	29.57	319.606
05/16/88 21:01	24.8	315.543	29.02	313.543
05/16/88 20:46	23.4	307.48	28.67	307.48
05/16/88 20:31	24.32	307.417	30.77	301.417
05/16/88 20:16	24.2	312.354	29.6	308.354
05/16/88 20:01	23.62	317.291	28.35	311.291
05/16/88 19:46	26.27	309.228	31.6	309.228
05/16/88 19:31	23.72	309.165	29.85	315.165
05/16/88 19:16	22.9	316.102	30.12	311.102
05/16/88 19:01	21.7	316.039	26.52	320.039
05/16/88 18:46	21.72	317.976	27.62	312.976
05/16/88 18:31	21.35	320.913	28.95	322.913
05/16/88 18:16	21.75	320.85	26.02	316.85
05/16/88 18:01	20.57	329.787	25.77	336.787
05/16/88 17:46	24.12	328.724	29.75	322.724
05/16/88 17:31	23	326.661	27.47	314.661
05/16/88 17:16	22.55	331.598	24.22	328.598
05/16/88 17:01	23.65	332.535	28.9	339.535
05/16/88 16:46	24.07	334.472	28.65	330.472
05/16/88 16:31	25.15	326.409	28.8	322.409
05/16/88 16:16	24.02	328.346	29.87	324.346
05/16/88 16:01	23.95	330.283	30.3	331.283
05/16/88 15:46	21.62	337.22	27.85	325.22
05/16/88 15:31	23.32	340.157	26.6	347.157



Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/16/88 15:16	27.55	335.094	32.07	337.094
05/16/88 15:01	24.3	336.031	28.82	338.031
05/16/88 14:46	24.45	336	29.1	338
05/16/88 14:31	23.87	341	27.92	340
05/16/88 14:16	22.77	341	28.05	332
05/16/88 14:01	23.37	343	28.7	345
05/16/88 13:46	24	341	29.97	340
05/16/88 13:31	24.22	344	30.12	344
05/16/88 13:16	26.57	343	33.75	342
05/16/88 13:01	25	346	27.97	341
05/16/88 12:46	25.52	344	30.95	339
05/16/88 12:31	22.52	345	26.57	348
05/16/88 12:16	24.15	350	30.3	346
05/16/88 12:01	24.7	351	32.5	349
05/16/88 11:46	22.4	345	25.95	338
05/16/88 11:31	22.05	345	27.37	348
05/16/88 11:16	20.07	342	25.67	342
05/16/88 11:01	20.05	347	25.87	349
05/16/88 10:46	20.67	346	23.72	340
05/16/88 10:31	20.3	345	24.17	344
05/16/88 10:16	22.95	347	27.77	349
05/16/88 10:01	22.47	345	27.42	351
05/16/88 09:46	19.97	346	24.9	348
05/16/88 09:31	22.52	346	28.12	346
05/16/88 09:16	20.8	341	26.25	346
05/16/88 09:01	23.12	347	27.55	346
05/16/88 08:46	24.62	347	30.4	352
05/16/88 08:31	24.6	345	28	346
05/16/88 08:16	22.35	338	26.57	338
05/16/88 08:01	20.07	340	25.27	345
05/16/88 07:46	20.02	347	22.65	349
05/16/88 07:31	20.55	351	25.85	351
05/16/88 07:16	20.72	351	27.17	347
05/16/88 07:01	22.52	344	29.9	355
05/16/88 06:46	26.02	347	33.27	352
05/16/88 06:31	24.87	357	27.87	355
05/16/88 06:16	24.27	357	28.8	351
05/16/88 06:01	25.55	350	30.02	355
05/16/88 05:46	26	347	33.02	356
05/16/88 05:31	21.52	358	27.7	355
05/16/88 05:16	23.25	4	28.22	353
05/16/88 05:01	24.82	355	28.5	357
05/16/88 04:46	23.8	350	27.6	356
05/16/88 04:31	23.25	349	27.32	353
05/16/88 04:16	19.17	15	24.85	358
05/16/88 04:01	22.6	5	28.42	-1
05/16/88 03:46	21.55	350	29.35	236
05/16/88 03:31	22.67	5	27.27	2
05/16/88 03:16	19.4	356	22.8	6
05/16/88 03:01	20.62	7	23.55	8
05/16/88 02:46	19.67	5	24.55	9
05/16/88 02:31	20.25	0	26	8
05/16/88 02:16	16.75	7	19.47	5
05/16/88 02:01	16.4	0	19.47	3
05/16/88 01:46	18.62	12	22.97	4
05/16/88 01:31	19.9	7	24.52	15
05/16/88 01:16	20.22	9	25.72	18
05/16/88 01:01	18.72	8	23.92	13
05/16/88 00:46	19.87	12	25.07	10
05/16/88 00:31	18.55	5	21.65	2
05/16/88 00:16	21.22	6	24	0
05/16/88 00:01	19.92	7	26.32	-2
05/15/88 23:46	18.27	5	23.05	-2
05/15/88 23:31	20.42	357	24.82	1
05/15/88 23:16	19.9	8	28.6	-1
05/15/88 23:01	18.8	356	24.37	8
05/15/88 22:46	19.52	349	24.4	3
05/15/88 22:31	21.95	357	27.52	2
05/15/88 22:16	21.8	352	26.7	4
05/15/88 22:01	22.5	0	24.2	0

Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/15/88 21:46	21.6	8	27.22	8
05/15/88 21:31	20.55	10	25.65	14
05/15/88 21:16	16.95	8	20.57	7
05/15/88 21:01	16.47	10	21.2	6
05/15/88 20:46	19.5	16	23.1	19
05/15/88 20:31	19.72	20	23.92	24
05/15/88 20:16	19.12	20	22.9	22
05/15/88 20:01	18.55	24	21.77	16
05/15/88 19:46	20.22	20	26.72	26
05/15/88 19:31	22.3	18	26.47	25
05/15/88 19:16	21.92	23	25.77	29
05/15/88 19:01	22.07	14	26.65	4
05/15/88 18:46	23.22	25	26.22	28
05/15/88 18:31	21.62	27	25.35	23
05/15/88 18:16	23.85	25	31.27	27
05/15/88 18:01	23.82	24	26.67	14
05/15/88 17:46	23.45	18	28.55	21
05/15/88 17:31	22.82	16	27.72	16
05/15/88 17:16	22.75	17	29.72	20
05/15/88 17:01	20.45	27	23.5	41
05/15/88 16:46	21.05	18	25.32	19
05/15/88 16:31	22.37	10	26.77	11
05/15/88 16:16	21.15	20	24.32	22
05/15/88 16:01	19.87	19	22.55	15
05/15/88 15:46	17.12	10	22.75	19
05/15/88 15:31	15.77	6	20.15	10
05/15/88 15:16	15.77	9	18.42	9
05/15/88 15:01	14.35	4	18.85	8
05/15/88 14:46	12.87	2	16	355
05/15/88 14:31	13	0	15.97	-1
05/15/88 14:16	14.27	11	17.77	5
05/15/88 14:01	14.27	9	17.35	10
05/15/88 13:46	15.3	4	17.35	7
05/15/88 13:31	14.27	-2	16.8	355
05/15/88 13:16	11.52	350	15.9	351
05/15/88 13:01	9.85	349	12.42	347
05/15/88 12:46	9.07	351	10.67	355
05/15/88 12:31	9.22	352	11.12	352
05/15/88 12:16	8.7	15	10.4	353
05/15/88 12:01	9.3	11	10.9	357
05/15/88 11:46	9.05	0	10.47	357
05/15/88 11:31	8.17	354	9.72	355
05/15/88 11:16	6.4	354	7.5	354
05/15/88 11:01	6.75	353	8.77	354
05/15/88 10:46	6.2	349	7.45	348
05/15/88 10:31	6.45	357	7.62	353
05/15/88 10:16	5.87	6	7.45	-2
05/15/88 10:01	6.05	10	6.9	2
05/15/88 09:46	6.82	13	7.87	8
05/15/88 09:31	7.05	19	8.6	20
05/15/88 09:16	6.12	21	7.72	24
05/15/88 09:01	6.45	19	7.45	20
05/15/88 08:46	6.1	11	6.95	11
05/15/88 08:31	5.92	12	6.4	14
05/15/88 08:16	5.72	13	6.42	11
05/15/88 08:01	5.67	14	6.72	15
05/15/88 07:46	4.92	9	5.45	6
05/15/88 07:31	4.82	4	5.47	4
05/15/88 07:16	4.6	5	5.1	4
05/15/88 07:01	4.12	2	4.67	-1
05/15/88 06:46	4.12	2	4.82	5
05/15/88 06:31	5.2	11	5.82	11
05/15/88 06:16	4.77	12	5.35	12
05/15/88 06:01	5.3	11	5.85	12
05/15/88 05:46	4.27	2	4.97	2
05/15/88 05:31	4.02	1	4.47	1
05/15/88 05:16	3.7	2	4.05	-1
05/15/88 05:01	2.45	345	3.22	351
05/15/88 04:46	2	345	2.52	343
05/15/88 04:31	1.1	356	1.47	357

Date/Time	Wind Spd mph	Direction deg T	Peak Spd mph	Peak Direction deg T
05/15/88 04:16	2.5	356	3.17	354
05/15/88 04:01	3.5	354	3.85	353
05/15/88 03:46	3.8	347	4.05	346
05/15/88 03:31	2.52	314	3.27	327
05/15/88 03:16	3.1	311	3.82	308
05/15/88 03:01	2.5	331	3.15	330
05/15/88 02:46	2.72	322	3.2	329
05/15/88 02:31	3.15	319	3.77	319
05/15/88 02:16	3.32	319	3.62	319
05/15/88 02:01	2.87	317	3.22	319
05/15/88 01:46	3.85	316	4.17	316
05/15/88 01:31	3.82	313	4.32	314
05/15/88 01:16	4.27	305	4.85	300
05/15/88 01:01	5.15	291	5.42	289
05/15/88 00:46	4.85	290	5.07	289
05/15/88 00:31	5.37	287	5.72	286
05/15/88 00:16	4.62	287	5.15	286
05/15/88 00:01	4.12	286	5.2	286
05/14/88 23:45	5.27	287	5.85	285
05/14/88 23:30	6.37	281	6.92	276
05/14/88 23:15	6.55	275	6.92	274
05/14/88 23:00	6.32	276	6.97	276
05/14/88 22:45	5.57	284	6.3	281
05/14/88 22:30	5.95	279	6.65	275
05/14/88 22:15	6.27	280	6.67	279
05/14/88 22:00	5.22	276	5.57	270
05/14/88 21:45	5.77	271	6.27	273
05/14/88 21:30	5.67	278	6.5	277
05/14/88 21:15	5.8	280	6.27	282
05/14/88 21:00	5.47	283	6.37	283
05/14/88 20:45	5	278	5.82	278
05/14/88 20:30	5.45	274	6.07	275
05/14/88 20:15	6.02	275	6.65	275
05/14/88 20:00	6.52	279	7.07	280
05/14/88 19:45	6.3	276	7.37	275
05/14/88 19:30	6.37	272	7.42	273
05/14/88 19:15	7.47	272	8.6	271
05/14/88 19:00	7.22	268	8.32	274
05/14/88 18:45	7.15	268	9	268
05/14/88 18:30	7.37	268	8.25	268
05/14/88 18:15	7.97	269	9.12	270
05/14/88 18:00	6.35	271	8.17	271
05/14/88 17:45	6.37	273	7.47	274
05/14/88 17:30	6.72	276	8.57	273
05/14/88 17:15	7.47	277	8.2	268
05/14/88 17:00	7.8	270	9.65	263
05/14/88 16:45	5.5	271	7.12	273
05/14/88 16:30	5.32	281	6.67	283
05/14/88 16:15	5.77	284	6.97	285
05/14/88 16:00	6.17	292	7.4	290
05/14/88 15:45	6.12	288	7.75	286

## **Appendix C**

### **Surface Weather Tabulations**

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Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/21/88 00:16	-0.5	29.44	51
05/21/88 00:01	-0.55	29.44	54
05/20/88 23:46	-0.63	29.45	63
05/20/88 23:31	-0.58	29.45	65
05/20/88 23:16	-0.55	29.45	71
05/20/88 23:01	-0.63	29.45	89
05/20/88 22:46	-0.7	29.46	107
05/20/88 22:31	-0.73	29.46	46
05/20/88 22:16	-0.7	29.46	48
05/20/88 22:01	-0.85	29.46	70
05/20/88 21:46	-0.93	29.46	66
05/20/88 21:31	-0.93	29.47	51
05/20/88 21:16	-0.93	29.46	103
05/20/88 21:01	-0.95	29.47	84
05/20/88 20:46	-0.9	29.46	74
05/20/88 20:31	-0.78	29.46	99
05/20/88 20:16	-0.85	29.47	93
05/20/88 20:01	-0.88	29.46	86
05/20/88 19:46	-0.8	29.47	71
05/20/88 19:31	-0.75	29.46	74
05/20/88 19:16	-0.68	29.46	92
05/20/88 19:01	-0.65	29.47	104
05/20/88 18:46	-0.55	29.47	121
05/20/88 18:31	-0.6	29.47	121
05/20/88 18:16	-0.53	29.47	127
05/20/88 18:01	-0.53	29.47	123
05/20/88 17:46	-0.53	29.47	119
05/20/88 17:31	-0.6	29.47	108
05/20/88 17:16	-0.63	29.48	104
05/20/88 17:01	-0.65	29.47	112
05/20/88 16:46	-0.63	29.47	125
05/20/88 16:31	-0.6	29.47	148
05/20/88 16:16	-0.58	29.48	152
05/20/88 16:01	-0.5	29.47	194
05/20/88 15:46	-0.5	29.48	198
05/20/88 15:31	-0.5	29.48	226
05/20/88 15:16	-0.5	29.48	271
05/20/88 15:01	-0.63	29.48	200
05/20/88 14:46	-0.5	29.48	238
05/20/88 14:31	-0.53	29.48	200
05/20/88 14:16	-0.45	29.46	238
05/20/88 14:01	-0.35	29.48	238
05/20/88 13:46	-0.43	29.48	218
05/20/88 13:31	-0.35	29.48	216
05/20/88 13:16	-0.43	29.48	231
05/20/88 13:01	-0.6	29.48	188
05/20/88 12:46	-0.5	29.47	171
05/20/88 12:31	-0.35	29.47	275
05/20/88 12:16	-0.3	29.47	283
05/20/88 12:01	-0.4	29.47	341
05/20/88 11:46	-0.5	29.47	263
05/20/88 11:31	-0.48	29.46	262
05/20/88 11:16	-0.43	29.47	238
05/20/88 11:01	-0.45	29.47	281
05/20/88 10:46	-0.48	29.47	277
05/20/88 10:31	-0.45	29.47	265
05/20/88 10:16	-0.43	29.46	280
05/20/88 10:01	-0.35	29.46	273
05/20/88 09:46	-0.3	29.46	244
05/20/88 09:31	-0.33	29.46	279
05/20/88 09:16	-0.33	29.46	253
05/20/88 09:01	-0.33	29.46	270
05/20/88 08:46	-0.28	29.45	273
05/20/88 08:31	-0.15	29.45	475
05/20/88 08:16	-0.28	29.44	218
05/20/88 08:01	-0.8	29.44	231
05/20/88 07:46	-0.35	29.44	333
05/20/88 07:31	-0.33	29.44	304
05/20/88 07:16	-0.43	29.44	502
05/20/88 07:01	-0.75	29.43	221

Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/20/88 06:46	-0.93	29.43	254
05/20/88 06:31	-1.23	29.43	182
05/20/88 06:16	-1.43	29.42	132
05/20/88 06:01	-1.6	29.42	137
05/20/88 05:46	-1.93	29.42	171
05/20/88 05:31	-2.18	29.42	97
05/20/88 05:16	-2.28	29.42	104
05/20/88 05:01	-2.45	29.41	29
05/20/88 04:46	-2.68	29.42	106
05/20/88 04:31	-2.78	29.42	95
05/20/88 04:16	-2.88	29.42	82
05/20/88 04:01	-2.93	29.42	73
05/20/88 03:46	-3	29.42	57
05/20/88 03:31	-3.05	29.42	50
05/20/88 03:16	-3.15	29.42	44
05/20/88 03:01	-3.28	29.42	44
05/20/88 02:46	-3.3	29.42	43
05/20/88 02:31	-3.35	29.42	47
05/20/88 02:16	-3.4	29.42	51
05/20/88 02:01	-3.4	29.43	51
05/20/88 01:46	-3.4	29.43	40
05/20/88 01:31	-3.43	29.44	27
05/20/88 01:16	-3.5	29.44	29
05/20/88 01:01	-3.55	29.44	26
05/20/88 00:46	-3.55	29.45	26
05/20/88 00:31	-3.55	29.45	27
05/20/88 00:16	-3.53	29.46	28
05/20/88 00:01	-3.63	29.46	27
05/19/88 23:46	-3.68	29.47	29
05/19/88 23:31	-3.78	29.48	39
05/19/88 23:16	-3.8	29.48	39
05/19/88 23:01	-3.85	29.49	28
05/19/88 22:46	-3.9	29.5	19
05/19/88 22:31	-3.9	29.5	25
05/19/88 22:16	-3.9	29.51	38
05/19/88 22:01	-3.95	29.52	43
05/19/88 21:46	-3.98	29.53	46
05/19/88 21:31	-4.03	29.54	54
05/19/88 21:16	-4	29.54	72
05/19/88 21:01	-4.03	29.55	72
05/19/88 20:46	-3.98	29.56	68
05/19/88 20:31	-3.95	29.57	117
05/19/88 20:16	-3.9	29.58	125
05/19/88 20:01	-3.9	29.59	116
05/19/88 19:46	-4	29.6	121
05/19/88 19:31	-4.1	29.61	98
05/19/88 19:16	-4.03	29.61	118
05/19/88 19:01	-4.18	29.63	102
05/19/88 18:46	-4.28	29.63	89
05/19/88 18:31	-4.43	29.64	101
05/19/88 18:16	-4.5	29.65	117
05/19/88 18:01	-4.53	29.66	150
05/19/88 17:46	-4.6	29.66	201
05/19/88 17:31	-4.6	29.67	195
05/19/88 17:16	-4.7	29.67	238
05/19/88 17:01	-4.7	29.68	256
05/19/88 16:46	-4.65	29.69	305
05/19/88 16:31	-4.6	29.7	304
05/19/88 16:16	-4.68	29.71	270
05/19/88 16:01	-4.75	29.71	235
05/19/88 15:46	-4.73	29.71	265
05/19/88 15:31	-4.75	29.72	264
05/19/88 15:16	-4.78	29.72	300
05/19/88 15:01	-4.73	29.73	258
05/19/88 14:46	-4.65	29.74	324
05/19/88 14:31	-4.5	29.74	295
05/19/88 14:16	-4.58	29.75	332
05/19/88 14:01	-4.58	29.76	330
05/19/88 13:46	-4.68	29.77	318
05/19/88 13:31	-4.63	29.78	321

Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/19/88 13:16	-4.5	29.78	315
05/19/88 13:01	-4.45	29.79	336
05/19/88 12:46	-4.1	29.79	277
05/19/88 12:31	-4	29.79	317
05/19/88 12:16	-4.03	29.8	297
05/19/88 12:01	-4.08	29.81	313
05/19/88 11:46	-4	29.81	327
05/19/88 11:31	-3.85	29.82	354
05/19/88 11:16	-3.75	29.82	382
05/19/88 11:01	-3.75	29.83	305
05/19/88 10:46	-3.63	29.83	321
05/19/88 10:31	-3.58	29.84	332
05/19/88 10:16	-3.6	29.84	298
05/19/88 10:01	-3.65	29.84	315
05/19/88 09:46	-3.6	29.85	308
05/19/88 09:31	-3.58	29.85	288
05/19/88 09:16	-3.55	29.86	291
05/19/88 09:01	-3.63	29.87	279
05/19/88 08:46	-3.63	29.86	286
05/19/88 08:31	-3.6	29.87	277
05/19/88 08:16	-3.73	29.87	258
05/19/88 08:01	-3.7	29.88	287
05/19/88 07:46	-3.8	29.88	206
05/19/88 07:31	-3.78	29.89	250
05/19/88 07:16	-3.85	29.89	241
05/19/88 07:01	-3.93	29.89	213
05/19/88 06:46	-3.95	29.89	217
05/19/88 06:31	-4	29.89	221
05/19/88 06:16	-4.25	29.89	201
05/19/88 06:01	-4.4	29.89	192
05/19/88 05:46	-4.43	29.89	179
05/19/88 05:31	-4.55	29.9	172
05/19/88 05:16	-4.78	29.9	161
05/19/88 05:01	-4.95	29.9	158
05/19/88 04:46	-5.03	29.91	130
05/19/88 04:31	-5.13	29.91	133
05/19/88 04:16	-5.15	29.92	125
05/19/88 04:01	-5.15	29.92	124
05/19/88 03:46	-5.13	29.92	117
05/19/88 03:31	-5.13	29.92	143
05/19/88 03:16	-5.25	29.92	116
05/19/88 03:01	-5.3	29.92	96
05/19/88 02:46	-5.2	29.93	111
05/19/88 02:31	-5.18	29.93	97
05/19/88 02:16	-5.2	29.93	141
05/19/88 02:01	-5.3	29.93	103
05/19/88 01:46	-5.38	29.93	75
05/19/88 01:31	-5.45	29.94	74
05/19/88 01:16	-5.48	29.94	106
05/19/88 01:01	-5.6	29.94	83
05/19/88 00:46	-5.58	29.94	85
05/19/88 00:31	-5.7	29.95	72
05/19/88 00:16	-5.83	29.95	63
05/19/88 00:01	-5.93	29.95	60
05/18/88 23:46	-5.98	29.96	54
05/18/88 23:31	-5.93	29.96	71
05/18/88 23:16	-5.95	29.96	61
05/18/88 23:01	-5.98	29.96	76
05/18/88 22:46	-5.98	29.96	82
05/18/88 22:31	-6.03	29.97	93
05/18/88 22:16	-6.05	29.97	88
05/18/88 22:01	-6.13	29.97	77
05/18/88 21:46	-6.15	29.97	106
05/18/88 21:31	-6.28	29.97	78
05/18/88 21:16	-6.35	29.97	89
05/18/88 21:01	-6.25	29.97	80
05/18/88 20:46	-6.05	29.98	138
05/18/88 20:31	-6.18	29.97	143
05/18/88 20:16	-6.25	29.97	179
05/18/88 20:01	-6.33	29.98	132

Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/18/88 19:46	-6.28	29.98	104
05/18/88 19:31	-6.38	29.98	142
05/18/88 19:16	-6.58	29.98	139
05/18/88 19:01	-6.68	29.98	154
05/18/88 18:46	-6.78	29.99	160
05/18/88 18:31	-6.88	29.99	157
05/18/88 18:16	-6.85	29.99	186
05/18/88 18:01	-6.83	29.99	169
05/18/88 17:46	-6.58	29.99	187
05/18/88 17:31	-6.6	30	186
05/18/88 17:16	-6.68	30	180
05/18/88 17:01	-6.6	29.99	257
05/18/88 16:46	-6.78	29.99	211
05/18/88 16:31	-6.73	30	256
05/18/88 16:16	-6.73	30	230
05/18/88 16:01	-6.65	30.01	240
05/18/88 15:46	-6.48	30.01	243
05/18/88 15:31	-6.43	30.02	313
05/18/88 15:16	-6.6	30.01	297
05/18/88 15:01	-6.63	30.02	306
05/18/88 14:46	-6.68	30.02	344
05/18/88 14:31	-6.55	30.02	322
05/18/88 14:16	-6.58	30.01	330
05/18/88 14:01	-6.48	30.01	360
05/18/88 13:46	-6.5	30.01	337
05/18/88 13:31	-6.38	30.01	451
05/18/88 13:16	-6.28	30.02	421
05/18/88 13:01	-6.23	30.01	438
05/18/88 12:46	-6.08	30.02	450
05/18/88 12:31	-6.2	30.02	559
05/18/88 12:16	-6.33	30.02	483
05/18/88 12:01	-6.43	30.02	491
05/18/88 11:46	-6.6	30.02	453
05/18/88 11:31	-6.6	30.02	521
05/18/88 11:16	-6.65	30.03	488
05/18/88 11:01	-6.8	30.03	455
05/18/88 10:46	-6.8	30.03	487
05/18/88 10:31	-6.88	30.02	549
05/18/88 10:16	-6.85	30.03	539
05/18/88 10:01	-7.05	30.03	534
05/18/88 09:46	-7.28	30.03	439
05/18/88 09:31	-7.38	30.04	404
05/18/88 09:16	-7.23	30.04	458
05/18/88 09:01	-7.4	30.04	427
05/18/88 08:46	-7.4	30.05	565
05/18/88 08:31	-7.65	30.05	293
05/18/88 08:16	-7.88	30.05	340
05/18/88 08:01	-8.05	30.06	272
05/18/88 07:46	-8.08	30.06	270
05/18/88 07:31	-8.18	30.06	236
05/18/88 07:16	-8.25	30.06	235
05/18/88 07:01	-8.28	30.06	260
05/18/88 06:46	-8.25	30.07	223
05/18/88 06:31	-8.43	30.07	205
05/18/88 06:16	-8.48	30.07	190
05/18/88 06:01	-8.43	30.07	192
05/18/88 05:46	-8.43	30.07	187
05/18/88 05:31	-8.45	30.07	178
05/18/88 05:16	-8.58	30.07	165
05/18/88 05:01	-8.63	30.06	153
05/18/88 04:46	-8.68	30.07	142
05/18/88 04:31	-8.7	30.07	148
05/18/88 04:16	-8.83	30.07	136
05/18/88 04:01	-8.85	30.07	117
05/18/88 03:46	-8.8	30.08	117
05/18/88 03:31	-8.8	30.08	129
05/18/88 03:16	-8.85	30.09	102
05/18/88 03:01	-8.83	30.08	100
05/18/88 02:46	-8.85	30.09	97
05/18/88 02:31	-8.83	30.09	91

Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/18/88 02:16	-9	30.09	82
05/18/88 02:01	-8.95	30.09	83
05/18/88 01:46	-8.93	30.09	79
05/18/88 01:31	-8.75	30.09	73
05/18/88 01:16	-8.83	30.09	70
05/18/88 01:01	-8.85	30.09	70
05/18/88 00:46	-8.93	30.1	66
05/18/88 00:31	-8.7	30.1	68
05/18/88 00:16	-8.73	30.1	71
05/18/88 00:01	-8.68	30.1	73
05/17/88 23:46	-8.68	30.11	63
05/17/88 23:31	-8.78	30.11	66
05/17/88 23:16	-8.78	30.11	75
05/17/88 23:01	-8.65	30.12	80
05/17/88 22:46	-8.6	30.12	65
05/17/88 22:31	-8.55	30.12	71
05/17/88 22:16	-8.65	30.12	79
05/17/88 22:01	-8.53	30.12	81
05/17/88 21:46	-8.48	30.12	82
05/17/88 21:31	-8.45	30.14	88
05/17/88 21:16	-8.53	30.13	103
05/17/88 21:01	-8.35	30.13	105
05/17/88 20:46	-8.38	30.13	104
05/17/88 20:31	-8.5	30.14	110
05/17/88 20:16	-8.4	30.14	123
05/17/88 20:01	-8.55	30.14	137
05/17/88 19:46	-8.53	30.14	140
05/17/88 19:31	-8.6	30.15	147
05/17/88 19:16	-8.5	30.15	145
05/17/88 19:01	-8.38	30.15	133
05/17/88 18:46	-8.25	30.14	175
05/17/88 18:31	-8.35	30.14	171
05/17/88 18:16	-8.13	30.15	176
05/17/88 18:01	-8.1	30.15	173
05/17/88 17:46	-8.2	30.15	219
05/17/88 17:31	-8.3	30.16	204
05/17/88 17:16	-8.33	30.16	227
05/17/88 17:01	-8.35	30.16	206
05/17/88 16:46	-8.28	30.16	246
05/17/88 16:31	-8.03	30.16	293
05/17/88 16:16	-7.98	30.17	301
05/17/88 16:01	-8.05	30.16	303
05/17/88 15:46	-7.85	30.16	434
05/17/88 15:31	-7.83	30.17	333
05/17/88 15:16	-7.93	30.17	573
05/17/88 15:01	-7.7	30.17	349
05/17/88 14:46	-7.55	30.17	356
05/17/88 14:31	-7.58	30.18	287
05/17/88 14:16	-7.53	30.18	358
05/17/88 14:01	-7.5	30.17	387
05/17/88 13:46	-7.53	30.18	622
05/17/88 13:31	-7.48	30.18	381
05/17/88 13:16	-7.65	30.18	460
05/17/88 13:01	-7.75	30.18	313
05/17/88 12:46	-7.85	30.18	435
05/17/88 12:31	-7.85	30.18	396
05/17/88 12:16	-7.95	30.19	527
05/17/88 12:01	-7.78	30.18	427
05/17/88 11:46	-7.73	30.19	438
05/17/88 11:31	-7.73	30.19	414
05/17/88 11:16	-7.88	30.19	487
05/17/88 11:01	-7.93	30.2	291
05/17/88 10:46	-7.93	30.2	400
05/17/88 10:31	-7.85	30.2	492
05/17/88 10:16	-7.88	30.21	396
05/17/88 10:01	-8.03	30.2	404
05/17/88 09:46	-7.93	30.2	403
05/17/88 09:31	-7.93	30.2	406
05/17/88 09:16	-8.18	30.2	441
05/17/88 09:01	-8.23	30.21	404

Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/17/88 08:46	-8.3	30.21	434
05/17/88 08:31	-8.2	30.22	419
05/17/88 08:16	-8.4	30.21	399
05/17/88 08:01	-8.35	30.21	355
05/17/88 07:46	-8.63	30.19	373
05/17/88 07:31	-8.45	30.22	368
05/17/88 07:16	-8.6	30.22	339
05/17/88 07:01	-8.73	30.22	299
05/17/88 06:46	-8.8	30.21	243
05/17/88 06:31	-8.68	30.22	322
05/17/88 06:16	-8.78	30.22	297
05/17/88 06:01	-8.8	30.22	252
05/17/88 05:46	-8.63	30.22	343
05/17/88 05:31	-8.63	30.22	196
05/17/88 05:16	-8.55	30.23	206
05/17/88 05:01	-8.48	30.23	222
05/17/88 04:46	-8.4	30.22	178
05/17/88 04:31	-8.4	30.19	125
05/17/88 04:16	-8.2	30.21	178
05/17/88 04:01	-8.28	30.22	146
05/17/88 03:46	-7.98	30.2	108
05/17/88 03:31	-7.95	30.22	112
05/17/88 03:16	-7.85	30.19	101
05/17/88 03:01	-7.48	30.21	108
05/17/88 02:46	-7.2	30.22	93
05/17/88 02:31	-7.15	30.21	81
05/17/88 02:16	-7.13	30.21	85
05/17/88 02:01	-6.93	30.2	75
05/17/88 01:46	-7	30.18	75
05/17/88 01:31	-6.6	30.19	71
05/17/88 01:16	-6.63	30.18	66
05/17/88 01:01	-6.55	30.19	69
05/17/88 00:46	-6.65	30.19	68
05/17/88 00:31	-6.6	30.2	64
05/17/88 00:16	-6.63	30.19	67
05/17/88 00:01	-6.48	30.2	70
05/16/88 23:46	-6.43	30.21	70
05/16/88 23:31	-6.15	30.2	64
05/16/88 23:16	-5.8	30.2	63
05/16/88 23:01	-5.7	30.2	63
05/16/88 22:46	-5.8	30.2	68
05/16/88 22:31	-5.8	30.2	71
05/16/88 22:16	-5.73	30.22	69
05/16/88 22:01	-5.75	30.22	74
05/16/88 21:46	-5.63	30.22	74
05/16/88 21:31	-5.63	30.22	72
05/16/88 21:16	-5.65	30.22	78
05/16/88 21:01	-5.63	30.21	92
05/16/88 20:46	-5.35	30.21	95
05/16/88 20:31	-5.3	30.19	104
05/16/88 20:16	-5.15	30.21	169
05/16/88 20:01	-5.28	30.21	111
05/16/88 19:46	-5.15	30.21	150
05/16/88 19:31	-4.95	30.21	143
05/16/88 19:16	-4.95	30.21	138
05/16/88 19:01	-5.1	30.21	139
05/16/88 18:46	-5.08	30.21	163
05/16/88 18:31	-5.05	30.22	169
05/16/88 18:16	-4.9	30.2	201
05/16/88 18:01	-5.1	30.21	177
05/16/88 17:46	-5.23	30.2	183
05/16/88 17:31	-5.18	30.21	200
05/16/88 17:16	-5.28	30.2	243
05/16/88 17:01	-5.33	30.21	199
05/16/88 16:46	-5.23	30.21	230
05/16/88 16:31	-4.85	30.21	234
05/16/88 16:16	-4.8	30.2	286
05/16/88 16:01	-4.75	30.2	195
05/16/88 15:46	-4.4	30.2	225
05/16/88 15:31	-4.45	30.2	277

Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/16/88 15:16	-4.53	30.21	309
05/16/88 15:01	-4.55	30.21	314
05/16/88 14:46	-4.63	30.2	314
05/16/88 14:31	-4.48	30.21	308
05/16/88 14:16	-4.45	30.21	337
05/16/88 14:01	-4.38	30.22	353
05/16/88 13:46	-4.43	30.22	454
05/16/88 13:31	-4.5	30.21	364
05/16/88 13:16	-4.55	30.22	367
05/16/88 13:01	-4.58	30.22	373
05/16/88 12:46	-4.48	30.21	338
05/16/88 12:31	-4.68	30.21	370
05/16/88 12:16	-4.8	30.22	378
05/16/88 12:01	-5.18	30.21	348
05/16/88 11:46	-5.55	30.23	340
05/16/88 11:31	-5.73	30.23	331
05/16/88 11:16	-5.55	30.24	318
05/16/88 11:01	-5.35	30.22	303
05/16/88 10:46	-5.2	30.23	283
05/16/88 10:31	-5.3	30.23	297
05/16/88 10:16	-5.43	30.23	299
05/16/88 10:01	-5.18	30.22	274
05/16/88 09:46	-4.9	30.23	263
05/16/88 09:31	-4.78	30.23	309
05/16/88 09:16	-4.58	30.23	292
05/16/88 09:01	-4.63	30.22	293
05/16/88 08:46	-4.7	30.22	263
05/16/88 08:31	-4.78	30.22	252
05/16/88 08:16	-4.55	30.22	230
05/16/88 08:01	-4.43	30.21	206
05/16/88 07:46	-4.3	30.22	199
05/16/88 07:31	-4.25	30.22	266
05/16/88 07:16	-4.35	30.22	279
05/16/88 07:01	-4.5	30.23	237
05/16/88 06:46	-4.8	30.22	191
05/16/88 06:31	-4.75	30.21	241
05/16/88 06:16	-4.85	30.22	187
05/16/88 06:01	-4.73	30.21	137
05/16/88 05:46	-4.8	30.22	169
05/16/88 05:31	-4.75	30.21	144
05/16/88 05:16	-4.6	30.21	167
05/16/88 05:01	-4.6	30.21	213
05/16/88 04:46	-4.3	30.2	153
05/16/88 04:31	-4.38	30.21	180
05/16/88 04:16	-4.48	30.21	152
05/16/88 04:01	-4.68	30.2	136
05/16/88 03:46	-4.75	30.21	148
05/16/88 03:31	-4.9	30.2	143
05/16/88 03:16	-5.05	30.2	142
05/16/88 03:01	-5.13	30.2	110
05/16/88 02:46	-5.05	30.19	113
05/16/88 02:31	-5.08	30.19	115
05/16/88 02:16	-5.15	30.19	89
05/16/88 02:01	-5.35	30.19	104
05/16/88 01:46	-5.48	30.19	108
05/16/88 01:31	-5.78	30.19	98
05/16/88 01:16	-6	30.19	92
05/16/88 01:01	-6.23	30.19	92
05/16/88 00:46	-6.53	30.19	70
05/16/88 00:31	-6.78	30.19	66
05/16/88 00:16	-7.05	30.19	44
05/16/88 00:01	-7.15	30.19	48
05/15/88 23:46	-6.88	30.19	61
05/15/88 23:31	-6.85	30.18	64
05/15/88 23:16	-6.8	30.17	61
05/15/88 23:01	-6.83	30.18	65
05/15/88 22:46	-6.58	30.17	72
05/15/88 22:31	-6.38	30.18	75
05/15/88 22:16	-6.03	30.18	81
05/15/88 22:01	-5.88	30.17	87

Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/15/88 21:46	-5.73	30.17	77
05/15/88 21:31	-5.55	30.18	62
05/15/88 21:16	-5.5	30.18	51
05/15/88 21:01	-5.6	30.18	40
05/15/88 20:46	-5.75	30.17	39
05/15/88 20:31	-5.8	30.18	42
05/15/88 20:16	-5.85	30.18	61
05/15/88 20:01	-6	30.18	94
05/15/88 19:46	-6.08	30.18	98
05/15/88 19:31	-6.25	30.17	108
05/15/88 19:16	-6.35	30.17	116
05/15/88 19:01	-6.18	30.18	121
05/15/88 18:46	-6.18	30.17	132
05/15/88 18:31	-6.23	30.17	151
05/15/88 18:16	-6.33	30.17	180
05/15/88 18:01	-6.5	30.18	209
05/15/88 17:46	-6.58	30.17	242
05/15/88 17:31	-6.75	30.16	202
05/15/88 17:16	-6.55	30.17	232
05/15/88 17:01	-6.3	30.16	184
05/15/88 16:46	-5.43	30.16	205
05/15/88 16:31	-4.93	30.15	237
05/15/88 16:16	-4.03	30.15	264
05/15/88 16:01	-3	30.14	250
05/15/88 15:46	-2.7	30.14	267
05/15/88 15:31	-2.73	30.14	434
05/15/88 15:16	-2.68	30.14	404
05/15/88 15:01	-2.35	30.14	444
05/15/88 14:46	-2.28	30.14	461
05/15/88 14:31	-2.23	30.14	477
05/15/88 14:16	-2.23	30.14	504
05/15/88 14:01	-2.28	30.13	497
05/15/88 13:46	-2.4	30.13	500
05/15/88 13:31	-2.08	30.13	492
05/15/88 13:16	-1.98	30.12	517
05/15/88 13:01	-1.93	30.12	584
05/15/88 12:46	-2.13	30.12	589
05/15/88 12:31	-2.63	30.12	489
05/15/88 12:16	-2.58	30.12	463
05/15/88 12:01	-2.7	30.12	461
05/15/88 11:46	-2.68	30.12	503
05/15/88 11:31	-2.45	30.11	370
05/15/88 11:16	-2.1	30.1	527
05/15/88 11:01	-2.25	30.11	400
05/15/88 10:46	-2.15	30.1	486
05/15/88 10:31	-2.4	30.1	443
05/15/88 10:16	-2.6	30.1	536
05/15/88 10:01	-2.53	30.1	509
05/15/88 09:46	-2.7	30.09	497
05/15/88 09:31	-2.88	30.09	517
05/15/88 09:16	-2.98	30.09	474
05/15/88 09:01	-3.2	30.09	497
05/15/88 08:46	-3.58	30.09	452
05/15/88 08:31	-3.98	30.08	342
05/15/88 08:16	-4.13	30.08	290
05/15/88 08:01	-4	30.08	278
05/15/88 07:46	-3.75	30.08	370
05/15/88 07:31	-4.4	30.08	433
05/15/88 07:16	-4.98	30.07	229
05/15/88 07:01	-4.65	30.07	239
05/15/88 06:46	-4.25	30.07	356
05/15/88 06:31	-4.45	30.07	415
05/15/88 06:16	-4.58	30.07	350
05/15/88 06:01	-5.15	30.07	267
05/15/88 05:46	-5.15	30.07	161
05/15/88 05:31	-4.83	30.07	248
05/15/88 05:16	-4.63	30.06	228
05/15/88 05:01	-4.88	30.06	192
05/15/88 04:46	-4.75	30.06	188
05/15/88 04:31	-4.28	30.05	245

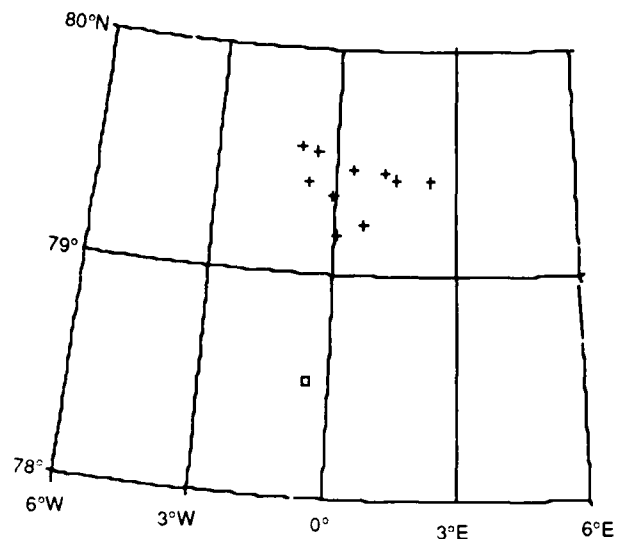
Date/Time	Temp C	Barometer inches	Solar Energy Watts/m^2
05/15/88 04:16	-4.33	30.06	276
05/15/88 04:01	-4.58	30.06	250
05/15/88 03:46	-4.35	30.06	258
05/15/88 03:31	-4.48	30.06	245
05/15/88 03:16	-4.63	30.06	235
05/15/88 03:01	-4.55	30.06	223
05/15/88 02:46	-4.7	30.06	206
05/15/88 02:31	-4.78	30.06	187
05/15/88 02:16	-4.93	30.06	180
05/15/88 02:01	-5.08	30.06	172
05/15/88 01:46	-4.88	30.06	163
05/15/88 01:31	-4.9	30.06	154
05/15/88 01:16	-4.98	30.06	146
05/15/88 01:01	-5.05	30.06	137
05/15/88 00:46	-5.05	30.06	130
05/15/88 00:31	-5	30.06	124
05/15/88 00:16	-4.95	30.06	117
05/15/88 00:01	-4.93	30.06	111



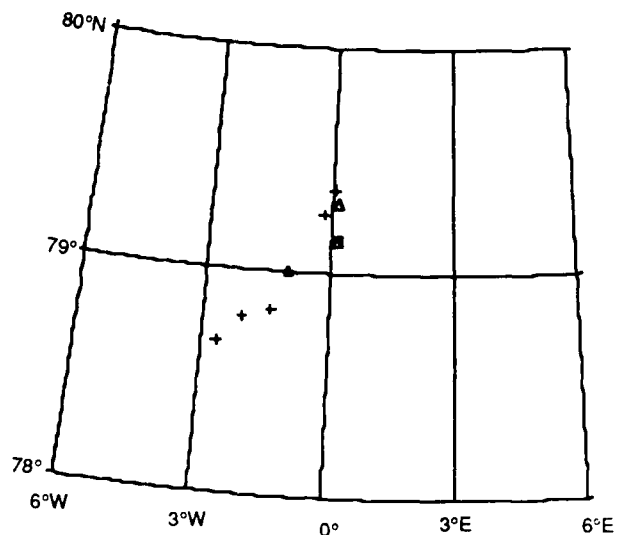
## **Appendix D**

### **CTD Tabulations**

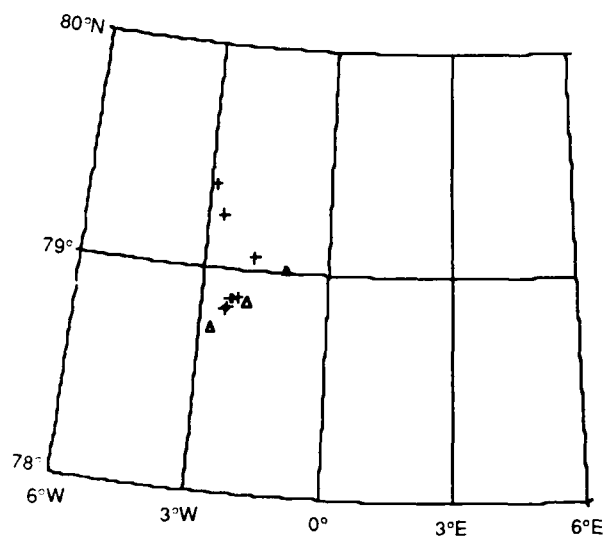
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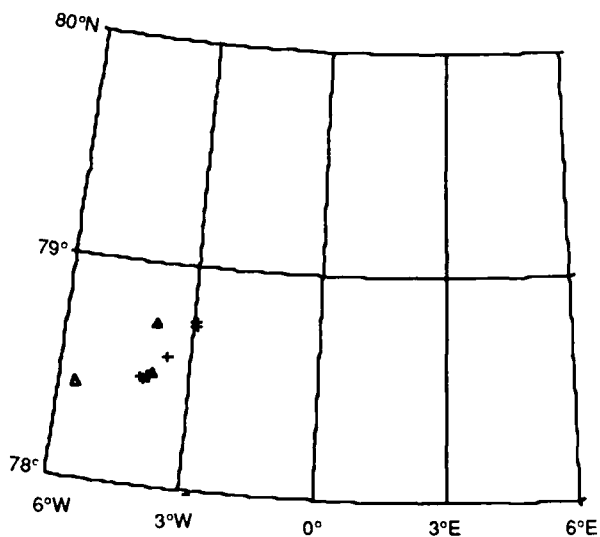
May 10-12



May 13-16



May 17-18



May 19-20

Ice camp location	Δ
CTD station	+
Current meter station	□

Map of CTD and S4 current meter stations relative to ice camp locations for different time periods of the acoustic exercise.

Cast 1					Cast 2					Cast 3				
Cond.	Temp.	Pres.	Sal.	Snd.Spd.	Cond.	Temp.	Pres.	Sal.	Snd.Spd.	Cond.	Temp.	Pres.	Sal.	Snd.Spd.
mS/cm	°C	dbars	ppt	m/s	mS/cm	°C	dbars	ppt	m/s	mS/cm	°C	dbars	ppt	m/s
26.6	-1.7	2.3	33.4	1439	26.5	-1.8	6.3	33.3	1439	27.1	-1.6	1.8	34	1440
26.6	-1.8	4.4	33.5	1439	26.6	-1.7	7.1	33.4	1439	26.9	-1.6	3.1	33.6	1440
26.7	-1.8	8.1	33.6	1439	26.6	-1.8	7.1	33.4	1439	26.9	-1.7	6.6	33.8	1440
26.6	-1.8	16.7	33.6	1439	26.5	-1.7	7.2	33.4	1439	27.1	-1.6	9.2	34	1440
26.6	-1.8	25.7	33.5	1439	26.5	-1.7	7.4	33.3	1439	26.9	-1.6	18.6	33.7	1440
26.7	-1.8	34.4	33.6	1439	26.5	-1.7	7.6	33.4	1439	26.9	-1.6	28.9	33.7	1440
26.9	-1.8	42.9	33.9	1440	26.6	-1.8	8.1	33.4	1439	27	-1.7	38.2	34	1440
27	-1.8	49.9	34	1440	26.5	-1.8	8.4	33.4	1439	27	-1.8	46.9	34.1	1440
27	-1.8	56.7	34.1	1440	26.5	-1.8	8.6	33.4	1439	27	-1.8	55.2	34.1	1440
27	-1.8	61.8	34.1	1440	26.5	-1.8	9.2	33.4	1439	27	-1.8	63.5	34.1	1441
27.1	-1.8	69.8	34.1	1441	26.5	-1.8	9.6	33.4	1439	27.1	-1.7	71.8	34.1	1441
27.1	-1.8	78.5	34.1	1441	26.5	-1.8	10.1	33.4	1439	27.1	-1.7	80.1	34.1	1441
27.1	-1.8	87.1	34.1	1441	26.5	-1.8	10.6	33.4	1439	27.3	-1.6	88.5	34.1	1442
27.1	-1.7	95.5	34.1	1441	26.5	-1.8	11.7	33.4	1439	27.2	-1.7	97	34.1	1441
27	-1.8	105	34.1	1441	26.6	-1.8	12.2	33.5	1439	27.2	-1.7	105	34.2	1442
27.1	-1.8	114	34.1	1441	26.5	-1.8	12.6	33.4	1439	27.3	-1.5	113	34.2	1443
27.3	-1.6	124	34.2	1443	26.5	-1.8	13.9	33.4	1439	27.7	-1.1	121	34.2	1445
27.9	-0.9	134	34.2	1446	26.5	-1.8	16.9	33.4	1439	28.8	0.11	130	34.3	1451
28.7	-0.1	143	34.3	1450	26.5	-1.8	19.6	33.4	1439	29.4	0.69	137	34.4	1453
29.2	0.45	152	34.4	1453	26.5	-1.8	21.7	33.4	1439	30	1.32	144	34.4	1457
29.7	0.94	160	34.5	1455	26.5	-1.8	24.6	33.4	1439	30.3	1.57	152	34.5	1458
30	1.31	170	34.5	1457	26.5	-1.8	26.9	33.4	1439	30.4	1.73	160	34.5	1459
30.3	1.58	180	34.5	1458	26.6	-1.8	28.7	33.5	1439	30.5	1.77	169	34.6	1459
30.5	1.79	190	34.6	1460	26.7	-1.8	31	33.6	1439	30.5	1.78	177	34.6	1459
30.6	1.86	199	34.6	1460	26.8	-1.8	33.7	33.8	1440	30.5	1.79	186	34.6	1459
30.6	1.84	206	34.6	1460	26.8	-1.8	35.7	33.9	1440	30.5	1.75	194	34.6	1459
					26.9	-1.8	37.9	33.9	1440	30.5	1.72	203	34.6	1459
					26.9	-1.8	39.9	33.9	1440	30.5	1.74	211	34.6	1460
					26.9	-1.8	42.9	34	1440	30.6	1.78	219	34.6	1460
					27	-1.8	46.2	34.1	1440	30.6	1.81	228	34.6	1460
					27.1	-1.7	49.4	34.1	1440	30.6	1.82	236	34.6	1460
					27	-1.8	52.5	34.1	1440	30.6	1.81	244	34.6	1460
					27	-1.8	55.7	34.1	1440	30.6	1.79	253	34.6	1461
					27	-1.8	58.7	34.1	1440	30.6	1.8	262	34.6	1461
					27.1	-1.7	61.7	34.1	1441	30.7	1.85	270	34.6	1461
					27.1	-1.8	64.3	34.1	1441	30.7	1.84	278	34.6	1461
					27	-1.8	67.5	34.1	1440	30.6	1.72	287	34.6	1461
					27	-1.8	70.7	34.1	1441	30.5	1.65	295	34.6	1461
					27	-1.8	73.3	34.1	1441	30.4	1.57	304	34.6	1460
					27	-1.8	75.6	34.1	1441	30.5	1.6	312	34.6	1461
					27	-1.8	77	34.1	1441	30.4	1.58	320	34.6	1461
					27	-1.8	79.5	34.1	1441	30.5	1.59	329	34.6	1461
					27	-1.8	82	34.1	1441	30.5	1.6	337	34.6	1461
					27.1	-1.8	87	34.1	1441	30.5	1.6	345	34.7	1461
					27.1	-1.8	89.5	34.1	1441	30.5	1.65	354	34.6	1462
					27.1	-1.8	92	34.1	1441	30.5	1.59	362	34.6	1461
					27.1	-1.8	96.3	34.1	1441	30.5	1.61	370	34.7	1462
					27.1	-1.8	98.4	34.1	1441	30.5	1.58	378	34.7	1462
					27.1	-1.8	101	34.1	1441	30.5	1.62	386	34.7	1462
					27.1	-1.7	103	34.1	1441	30.5	1.56	395	34.6	1462
					27.2	-1.7	105	34.1	1442	30.5	1.57	403	34.7	1462
					27.3	-1.5	111	34.2	1443	30.5	1.57	411	34.7	1462
					27.4	-1.4	114	34.2	1443	30.5	1.6	419	34.7	1462
					27.7	-1.2	117	34.2	1444	30.5	1.58	427	34.7	1462
					28.4	-0.4	123	34.3	1448	30.5	1.57	435	34.7	1463
					28.6	-0.2	126	34.3	1449	30.5	1.57	443	34.7	1463
					29.1	0.33	133	34.4	1452	30.5	1.56	450	34.7	1463
					29.2	0.51	136	34.4	1453	30.5	1.55	458	34.7	1463
					29.6	0.83	141	34.4	1454	30.5	1.52	466	34.7	1463
					29.9	1.15	148	34.5	1456	30.5	1.48	473	34.7	1463
					30	1.28	150	34.5	1457	30.5	1.48	481	34.7	1463
					30.3	1.52	158	34.5	1458	30.4	1.45	489	34.7	1463
					30.3	1.58	161	34.6	1458	30.4	1.44	496	34.7	1463
					30.4	1.65	164	34.6	1458	30.4	1.4	504	34.7	1463
					30.5	1.73	169	34.6	1459					
					30.5	1.73	171	34.6	1459					
					30.5	1.76	179	34.6	1459					
					30.5	1.73	184	34.6	1459					
					30.5	1.77	192	34.6	1459					

Cast 4						Cast 5											
Cond.	Pres.	Temp.	Sal.	Snd.Spd.		Cond.	Pres.	Temp.	Sal.	Snd.Spd.							
mS/cm	dbars	°C	ppt	m/s		mS/cm	dbars	°C	ppt	m/s							
26.7	-1.7	1.3	33.5	1439		26.9	-1.7	7.1	33.9	1440		28	-0.7	101	34.1	1446	
26.9	-1.5	1.4	33.6	1440		27	-1.7	7.6	33.9	1440		28.3	-0.5	103	34.2	1447	
27.1	-1.7	3.9	34.1	1440		27	-1.7	8.7	34	1440		28.3	-0.4	105	34.2	1448	
27.1	-1.7	6.3	34.2	1440		27.3	-1.6	9.1	34.3	1441		28.5	-0.2	107	34.2	1449	
27.5	-1.7	8.2	34.7	1441		27.6	-1.7	9.9	34.7	1441		28.7	0	108	34.3	1450	
27.8	-1.7	9.6	35	1441		27.8	-1.7	10.4	35.1	1442		28.7	0.02	110	34.3	1450	
27.8	-1.7	10.4	35.1	1442		28	-1.7	11.2	35.4	1442		28.9	0.23	111	34.3	1451	
27.1	-1.7	10.9	34.1	1440		28.3	-1.7	11.9	35.8	1443		29.4	0.68	116	34.4	1453	
26.9	-1.6	12.7	33.8	1440		28.5	-1.7	12.4	36	1443		29.5	0.8	118	34.4	1454	
26.9	-1.6	15.4	33.8	1440		28.1	-1.6	13.2	35.4	1442		29.5	0.76	119	34.4	1454	
26.9	-1.7	18.7	33.8	1440		28.1	-1.6	13.7	35.3	1442		29.6	0.96	121	34.4	1455	
26.9	-1.7	21.7	33.8	1440		28.1	-1.6	13.9	35.4	1443		29.7	1.01	123	34.4	1455	
26.9	-1.7	25.2	33.9	1440		28.2	-1.6	14.2	35.5	1443		29.7	1.04	124	34.4	1455	
27	-1.7	29.2	33.9	1440		28.3	-1.6	14.6	35.6	1443		29.9	1.15	129	34.5	1456	
27	-1.7	33.7	33.9	1440		27	-1.6	14.9	33.9	1440		30	1.28	130	34.5	1456	
27	-1.7	38.4	34	1440		27	-1.7	15.6	33.9	1440		30.1	1.38	132	34.5	1456	
27	-1.8	42.7	34	1440		26.9	-1.6	16.2	33.8	1440		30.1	1.38	134	34.5	1457	
27	-1.8	47.4	34	1440		27	-1.6	16.6	33.8	1440		30.3	1.59	138	34.5	1458	
27	-1.8	51.8	34	1440		26.9	-1.7	17.6	33.8	1440		30.3	1.58	140	34.5	1458	
27	-1.8	56.3	34	1440		26.9	-1.7	18.1	33.8	1440		30.3	1.62	142	34.5	1458	
27	-1.8	61	34	1441		26.9	-1.7	18.2	33.7	1440		30.4	1.64	143	34.5	1458	
27	-1.7	65.5	34	1441		26.9	-1.6	19.7	33.7	1440		30.4	1.73	148	34.5	1459	
27.1	-1.7	69.7	34	1441		26.9	-1.7	21.6	33.7	1440		30.4	1.7	149	34.6	1458	
27.1	-1.7	74.3	34	1441		26.9	-1.6	23.6	33.7	1440		30.4	1.66	151	34.6	1458	
27.1	-1.7	79	34.1	1441		26.9	-1.6	25.4	33.7	1440		30.3	1.55	153	34.6	1458	
27.2	-1.6	83.6	34.1	1442		26.9	-1.6	26.9	33.7	1440		30.2	1.45	154	34.6	1457	
27.2	-1.6	88.3	34.1	1442		26.9	-1.6	29.2	33.7	1440		30.2	1.45	156	34.6	1457	
27.5	-1.4	92.8	34.1	1443		26.9	-1.6	31	33.7	1440		30.2	1.48	158	34.6	1458	
27.8	-1	97.3	34.2	1445		26.9	-1.6	32.7	33.8	1440		30.3	1.55	162	34.6	1458	
28.2	-0.5	102	34.2	1447		26.9	-1.6	34.5	33.7	1440		30.3	1.56	166	34.6	1458	
28.6	-0.1	106	34.3	1449		26.9	-1.6	36.2	33.8	1440		30.3	1.56	168	34.6	1458	
28.8	0.13	111	34.3	1450		26.9	-1.6	37.9	33.8	1440		30.3	1.48	172	34.6	1458	
29	0.35	115	34.3	1452		26.9	-1.7	39.4	33.8	1440		30.2	1.41	174	34.6	1458	
29.2	0.54	120	34.3	1452		27	-1.7	41.2	33.9	1440		30.1	1.35	175	34.6	1457	
29.3	0.62	124	34.3	1453		27	-1.7	42.9	34	1440		30.1	1.32	177	34.6	1457	
29.4	0.76	128	34.4	1454		27	-1.7	44.5	34	1440		30.1	1.29	182	34.6	1457	
29.5	0.84	133	34.4	1454		27	-1.7	46.2	34	1441		30	1.24	186	34.5	1457	
29.8	1.11	138	34.4	1455		27.1	-1.7	47.9	34	1441		30	1.23	188	34.6	1457	
30	1.32	142	34.5	1457		27.1	-1.7	49.4	34	1441		30	1.21	189	34.6	1457	
30.1	1.4	146	34.5	1457		27.1	-1.6	51	34.1	1441		30	1.18	196	34.6	1457	
30.1	1.41	151	34.5	1457		27.1	-1.7	52.8	34.1	1441		30	1.19	197	34.6	1457	
30.1	1.44	155	34.5	1457		27.1	-1.7	54.3	34.1	1441		30	1.16	202	34.6	1457	
30.2	1.52	159	34.5	1458		27.1	-1.7	55.8	34.1	1441		30	1.17	204	34.6	1457	
30.3	1.6	163	34.5	1458		27.1	-1.7	57.3	34.1	1441		30	1.17	205	34.6	1457	
30.3	1.61	168	34.5	1458		27.1	-1.8	58.8	34.1	1440		30	1.17	207	34.6	1457	
30.3	1.57	172	34.5	1458		27.1	-1.8	61.2	34.1	1441		30	1.23	211	34.6	1457	
30.3	1.56	177	34.5	1458		27.1	-1.8	63.2	34.1	1441		30	1.24	213	34.6	1457	
30.3	1.52	181	34.5	1458		27	-1.8	64.7	34.1	1441		30	1.22	217	34.6	1457	
30.2	1.4	186	34.5	1458		27.1	-1.8	66.7	34.1	1441		30	1.22	221	34.6	1457	
30.1	1.34	191	34.5	1457		27.1	-1.8	68.5	34.1	1441		30.2	1.42	226	34.6	1458	
30.1	1.3	195	34.5	1457		27.1	-1.8	69.8	34.1	1441		30.3	1.44	227	34.6	1459	
30.1	1.28	200	34.6	1457		27.1	-1.7	72	34.1	1441		30.3	1.48	232	34.6	1459	
30	1.27	204	34.5	1457		27.2	-1.6	73.7	34.1	1441		30.3	1.45	233	34.6	1459	
30.1	1.3	209	34.6	1458		27.3	-1.5	75.3	34.1	1442		30.3	1.45	239	34.6	1459	
30.1	1.27	213	34.6	1458		27.3	-1.5	77.1	34.1	1442		30.3	1.46	240	34.6	1459	
30.1	1.27	218	34.6	1458		27.3	-1.5	78.6	34.1	1442		30.2	1.38	245	34.6	1459	
30.1	1.29	222	34.6	1458		27.3	-1.6	80.1	34.1	1442		30.2	1.37	246	34.6	1459	
30.1	1.33	226	34.6	1458		27.3	-1.5	82.1	34.1	1442		30.4	1.6	250	34.6	1460	
30.2	1.35	231	34.6	1458		27.3	-1.5	83.8	34.1	1442		30.5	1.71	255	34.6	1460	
30.2	1.35	235	34.6	1458		27.2	-1.6	85.3	34.2	1442		30.5	1.71	256	34.6	1460	
30.1	1.33	240	34.6	1458		27.2	-1.7	87	34.1	1442		30.6	1.73	260	34.6	1460	
30.1	1.3	245	34.6	1458		27.3	-1.5	88.1	34.1	1442		30.6	1.7	262	34.7	1460	
30.1	1.24	249	34.6	1458		27.5	-1.3	89.8	34.1	1443		30.4	1.59	266	34.6	1460	
30	1.22	254	34.6	1458		27.6	-1.1	91.5	34.1	1444		30.4	1.58	267	34.6	1460	
30	1.12	259	34.6	1458		27.7	-1.1	93.3	34.2	1444		30.4	1.56	271	34.6	1460	
						27.7	-1.1	94.8	34.2	1444		30.4	1.54	276	34.6	1460	
						27.8	-1	96.6	34.2	1445		30.4	1.53	277	34.6	1460	
						27.8	-1	98.3	34.2	1445		30.4	1.52	281	34.6	1460	
						27.9	-0.9	99.8	34.2	1446		30.4	1.49	285	34.7	1460	

Cast 11A					Cast 12B				
Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.
mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s
26.4	2.6	-1.76	33.4	1438.6	27.1	5.2	-1.61	34.2	1440.5
26.4	2.6	-1.76	33.3	1438.6	27.1	5.9	-1.61	34.2	1440.5
26.4	5.2	-1.78	33.4	1438.5	27.1	6.0	-1.60	34.2	1440.5
26.4	10.7	-1.78	33.4	1438.6	27.1	5.9	-1.60	34.2	1440.5
26.4	15.7	-1.78	33.4	1438.8	27.1	6.0	-1.60	34.2	1440.5
26.5	20.3	-1.79	33.6	1439.1	27.1	6.9	-1.60	34.2	1440.5
26.7	25.4	-1.81	33.8	1439.4	27.1	6.9	-1.60	34.2	1440.5
26.7	30.5	-1.80	33.9	1439.6	27.1	7.0	-1.60	34.2	1440.5
26.9	37.9	-1.75	34.0	1440.1	27.1	7.2	-1.60	34.2	1440.5
26.8	45.2	-1.82	34.1	1439.9	27.1	7.2	-1.60	34.2	1440.5
27.0	52.1	-1.65	34.1	1440.8	27.1	7.8	-1.61	34.2	1440.5
26.9	59.0	-1.81	34.1	1440.2	27.1	9.2	-1.62	34.2	1440.5
26.9	65.2	-1.81	34.1	1440.3	27.1	9.9	-1.62	34.2	1440.5
26.9	69.6	-1.81	34.1	1440.4	27.1	11.0	-1.62	34.2	1440.5
26.9	75.6	-1.80	34.1	1440.5	27.1	14.3	-1.62	34.2	1440.5
26.9	81.6	-1.79	34.1	1440.7	27.1	17.4	-1.62	34.2	1440.6
26.9	87.0	-1.80	34.1	1440.8	27.1	22.4	-1.63	34.2	1440.6
26.9	92.2	-1.78	34.1	1440.9	27.1	25.6	-1.61	34.2	1440.8
27.0	97.4	-1.67	34.1	1441.6	27.2	28.9	-1.55	34.2	1441.1
27.2	104.4	-1.52	34.2	1442.4	27.2	32.1	-1.51	34.2	1441.4
27.7	110.9	-0.98	34.2	1445.2	27.3	35.4	-1.45	34.2	1441.7
28.4	117.8	-0.25	34.3	1448.8	27.3	38.9	-1.36	34.2	1442.2
28.7	123.9	.16	34.3	1450.8	28.1	42.2	-.57	34.4	1446.2
29.1	129.8	.51	34.4	1452.6	28.4	45.6	-.27	34.5	1447.7
29.4	136.4	.83	34.4	1454.2	28.8	48.8	.15	34.5	1449.7
29.7	141.4	1.10	34.5	1455.6	28.9	52.1	.28	34.5	1450.4
29.9	147.3	1.37	34.5	1456.9	29.3	55.6	.65	34.6	1452.3
30.0	153.8	1.51	34.5	1457.6	29.7	58.9	1.05	34.6	1454.1
30.2	160.2	1.64	34.5	1458.4	29.7	62.1	1.14	34.6	1454.6
30.2	166.1	1.70	34.5	1458.7	30.0	65.3	1.36	34.6	1455.7
30.3	172.0	1.72	34.6	1458.9	30.4	68.7	1.86	34.7	1458.0
30.3	178.1	1.74	34.6	1459.1	30.5	72.1	1.98	34.7	1458.6
30.3	184.5	1.71	34.6	1459.1	30.5	75.4	1.98	34.6	1458.6
30.3	189.3	1.74	34.6	1459.3	30.5	78.8	1.97	34.6	1458.6
30.3	188.4	1.74	34.6	1459.3	30.5	82.1	1.96	34.7	1458.6
30.3	187.5	1.75	34.6	1459.3	30.5	85.3	1.98	34.7	1458.8
30.3	186.4	1.74	34.6	1459.2	30.6	88.6	2.05	34.7	1459.1
30.3	185.4	1.74	34.6	1459.2	30.6	92.0	2.06	34.7	1459.2
30.3	180.6	1.71	34.6	1459.0	30.6	95.0	2.02	34.7	1459.1
30.3	174.1	1.74	34.5	1459.0	30.6	95.5	2.03	34.7	1459.2
30.2	167.7	1.71	34.5	1458.8	30.6	100.3	2.06	34.7	1459.4
30.2	162.4	1.71	34.5	1458.7	30.8	104.0	2.19	34.7	1460.1
30.1	156.4	1.58	34.5	1458.0	30.9	105.6	2.32	34.7	1460.7
30.0	150.6	1.47	34.5	1457.3	31.0	111.1	2.39	34.7	1461.0
29.8	145.0	1.24	34.5	1456.2	31.0	115.7	2.40	34.7	1461.2
29.6	139.8	1.08	34.4	1455.3	30.7	120.5	2.10	34.7	1459.9
29.2	133.7	.63	34.4	1453.2	30.7	123.5	2.07	34.7	1459.8
28.8	128.8	.22	34.3	1451.2	30.6	126.7	2.03	34.7	1459.7
28.6	122.7	.05	34.3	1450.3	30.7	129.9	2.11	34.7	1460.1
28.3	117.8	-.27	34.3	1448.7	30.7	133.4	2.11	34.7	1460.2
27.7	112.0	-.88	34.2	1445.6	30.8	136.5	2.19	34.7	1460.6
27.3	106.6	-1.35	34.1	1443.2	30.8	140.2	2.19	34.7	1460.7
27.2	102.2	-1.53	34.1	1442.3	30.8	145.2	2.16	34.7	1460.6
27.0	96.8	-1.64	34.1	1441.7	30.7	149.9	2.04	34.7	1460.1
26.9	90.6	-1.78	34.1	1440.9	30.7	154.6	2.04	34.7	1460.3
26.9	88.2	-1.79	34.1	1440.8	30.6	159.5	1.95	34.7	1459.9
26.9	83.8	-1.80	34.1	1440.7	30.5	164.1	1.86	34.7	1459.6
26.9	78.1	-1.80	34.1	1440.6	30.5	168.8	1.85	34.7	1459.6
26.9	72.6	-1.80	34.1	1440.5	30.5	173.6	1.85	34.7	1459.7
26.9	67.5	-1.81	34.1	1440.4	30.5	178.0	1.83	34.7	1459.7
26.9	66.6	-1.81	34.1	1440.3	30.4	182.4	1.78	34.7	1459.5
26.9	60.6	-1.82	34.1	1440.2	30.5	186.4	1.81	34.7	1459.7
26.8	52.7	-1.82	34.0	1440.0	30.4	191.0	1.75	34.7	1459.5
26.9	45.4	-1.73	34.0	1440.3	30.4	195.6	1.73	34.7	1459.5
26.8	37.7	-1.77	34.0	1440.0	30.4	199.6	1.72	34.7	1459.5
26.7	29.4	-1.80	33.9	1439.5	30.5	188.6	1.79	34.8	1459.7
26.6	21.6	-1.79	33.6	1439.1	30.5	183.4	1.80	34.7	1459.7
26.4	15.4	-1.78	33.4	1438.7	30.5	176.2	1.82	34.8	1459.7

Cast 12C						Cast 12D						Cast 12E					
Cond.	Pres.	Temp.	Sal.	Snd.Spd.		Cond.	Pres.	Temp.	Sal.	Snd.Spd.		Cond.	Pres.	Temp.	Sal.	Snd.Spd.	
mS/cm	dbars	°C	ppt	m/s		mS/cm	dbars	°C	ppt	m/s		mS/cm	dbars	°C	ppt	m/s	
27.0	2.8	-1.68	34.1	1440		26.7	5.0	-1.76	33.8	1439		26.7	5.5	-1.74	33.7	1439	
27.0	2.8	-1.67	34.1	1440		26.7	4.9	-1.76	33.8	1439		27.2	5.4	-1.74	33.8	1439	
27.0	2.8	-1.67	34.1	1440		26.7	4.8	-1.76	33.8	1439		26.7	10.1	-1.72	33.7	1439	
27.0	3.7	-1.69	34.1	1440		26.7	4.9	-1.76	33.8	1439		26.7	15.0	-1.72	33.8	1440	
26.9	6.0	-1.71	34.1	1440		26.7	6.3	-1.76	33.8	1439		26.8	19.8	-1.72	33.8	1440	
26.9	6.3	-1.71	34.1	1440		26.7	6.3	-1.76	33.8	1439		26.8	24.9	-1.75	34.0	1440	
26.9	6.5	-1.71	34.1	1440		26.7	10.3	-1.77	33.8	1439		26.8	30.1	-1.78	34.0	1440	
26.9	6.4	-1.71	34.1	1440		26.7	10.4	-1.78	33.8	1439		26.8	34.9	-1.81	34.1	1440	
26.9	9.6	-1.71	34.1	1440		26.7	15.0	-1.79	33.9	1439		26.9	40.1	-1.81	34.1	1440	
26.9	15.1	-1.72	34.1	1440		26.8	24.0	-1.79	33.9	1440		26.9	45.3	-1.80	34.1	1440	
26.9	21.4	-1.72	34.1	1440		26.8	29.5	-1.81	34.0	1440		26.9	50.4	-1.79	34.1	1440	
27.0	27.6	-1.71	34.1	1440		26.9	37.1	-1.80	34.1	1440		26.9	55.3	-1.79	34.1	1440	
27.0	33.7	-1.70	34.1	1440		26.9	44.4	-1.81	34.1	1440		26.9	60.2	-1.80	34.1	1440	
27.2	40.1	-1.52	34.2	1441		26.9	50.3	-1.80	34.1	1440		26.9	65.3	-1.78	34.1	1441	
27.3	46.3	-1.42	34.2	1442		27.0	56.6	-1.76	34.2	1441		27.0	70.2	-1.71	34.1	1441	
27.4	52.5	-1.32	34.2	1443		27.0	62.8	-1.76	34.2	1441		27.0	75.0	-1.68	34.1	1441	
27.7	58.8	-0.99	34.3	1445		27.1	68.5	-1.67	34.2	1441		27.2	79.5	-1.64	34.2	1441	
28.1	65.1	-0.52	34.3	1447		27.2	74.7	-1.52	34.2	1442		27.5	84.5	-1.26	34.2	1443	
28.4	71.2	-0.26	34.4	1448		27.6	80.7	-1.10	34.3	1444		27.9	87.2	-0.79	34.3	1446	
28.7	77.6	.04	34.4	1450		27.2	86.6	-1.54	34.3	1443		27.9	91.6	-0.71	34.3	1446	
29.0	83.8	.35	34.5	1451		28.1	92.5	-.57	34.4	1447		28.1	97.9	-.62	34.3	1447	
29.1	89.9	.48	34.5	1452		28.6	98.5	-.08	34.4	1450		28.5	105.7	-.16	34.4	1449	
29.6	96.2	1.05	34.6	1455		28.8	104.7	.18	34.4	1451		28.8	113.0	.13	34.4	1451	
29.9	102.5	1.27	34.6	1456		29.2	110.3	.51	34.5	1453		29.0	118.3	.37	34.4	1452	
30.0	108.8	1.43	34.6	1457		29.5	116.1	.86	34.6	1454		29.2	124.3	.55	34.5	1453	
30.2	115.0	1.59	34.6	1457		29.7	122.1	1.10	34.6	1456		29.5	131.2	.82	34.5	1454	
30.2	121.1	1.64	34.6	1458		29.9	127.8	1.28	34.6	1456		29.7	138.3	.99	34.6	1455	
30.3	127.3	1.73	34.6	1458		30.2	133.5	1.60	34.7	1458		30.1	144.5	1.46	34.6	1457	
30.3	134.8	1.74	34.6	1459		30.2	139.2	1.59	34.6	1458		30.3	150.5	1.62	34.7	1458	
30.4	141.8	1.83	34.7	1459		30.2	145.0	1.65	34.6	1458		30.3	157.4	1.68	34.7	1459	
30.4	147.8	1.85	34.7	1459		30.3	150.6	1.73	34.6	1459		30.3	164.3	1.65	34.7	1459	
30.5	153.8	1.87	34.7	1459		30.2	156.5	1.55	34.6	1458		30.4	170.8	1.76	34.7	1459	
30.5	159.9	1.87	34.7	1460		30.2	164.6	1.55	34.6	1458		30.4	177.1	1.75	34.7	1459	
30.4	165.9	1.77	34.7	1459		30.4	173.0	1.80	34.7	1459		30.5	183.3	1.84	34.7	1460	
30.4	171.7	1.78	34.7	1459		30.4	181.3	1.74	34.6	1459		30.3	189.4	1.81	34.6	1460	
30.4	177.7	1.81	34.7	1460		30.2	189.5	1.53	34.7	1458		30.4	195.2	1.74	34.7	1460	
30.5	183.9	1.82	34.7	1460		30.0	196.5	1.33	34.6	1458		30.2	201.1	1.69	34.6	1459	
30.4	190.0	1.80	34.7	1460		29.9	202.5	1.17	34.6	1457		30.0	206.9	1.36	34.6	1458	
30.4	197.9	1.80	34.7	1460		29.8	207.5	1.07	34.7	1457		29.7	213.0	.94	34.7	1456	
30.5	207.0	1.81	34.7	1460		29.8	215.1	1.08	34.7	1457		29.9	218.6	1.02	34.7	1457	
30.5	215.7	1.83	34.7	1460		29.8	222.8	1.06	34.7	1457		30.0	224.2	1.23	34.7	1458	
30.5	224.3	1.80	34.7	1460		29.9	230.2	1.15	34.7	1458		30.3	229.2	1.46	34.7	1459	
30.4	233.0	1.75	34.7	1460		29.9	237.5	1.18	34.7	1458							
30.4	241.7	1.72	34.7	1460		29.9	244.7	1.16	34.7	1458							
30.4	250.3	1.68	34.7	1460		29.9	252.0	1.13	34.7	1458							
30.3	258.8	1.60	34.7	1460		29.9	259.1	1.16	34.7	1458							
30.2	263.4	1.50	34.7	1460		30.0	266.1	1.23	34.7	1459							
30.2	264.2	1.49	34.7	1460		30.0	273.0	1.24	34.7	1459							
30.2	264.7	1.49	34.7	1460		30.0	280.0	1.24	34.7	1459							
30.2	271.7	1.49	34.7	1460		30.1	285.9	1.33	34.7	1459							
30.2	280.6	1.48	34.7	1460		30.2	290.3	1.38	34.7	1460							
30.2	289.6	1.46	34.7	1460		30.2	297.1	1.42	34.7	1460							
30.3	298.1	1.50	34.7	1460		30.2	303.9	1.44	34.7	1460							
30.3	300.5	1.51	34.7	1460		30.2	310.6	1.41	34.7	1460							
30.3	300.6	1.51	34.7	1460		30.2	317.3	1.40	34.7	1460							
						30.1	323.9	1.35	34.7	1460							
						30.1	330.5	1.33	34.7	1460							
						30.1	331.2	1.32	34.7	1460							

Cast 12F					Cast 12G				
Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.
mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s
26.2	3.7	-1.69	33.0	1438	26.1	6.3	-1.76	33.0	1438
26.2	7.3	-1.69	33.0	1439	26.1	6.8	-1.74	33.0	1438
26.2	7.6	-1.69	33.0	1439	26.1	14.0	-1.77	33.0	1438
26.2	7.6	-1.68	33.0	1439	26.2	22.7	-1.78	33.2	1439
26.2	7.6	-1.66	33.0	1439	26.3	25.7	-1.79	33.3	1439
26.2	7.5	-1.67	33.0	1439	26.6	34.1	-1.77	33.7	1439
26.2	7.1	-1.66	33.0	1439	26.9	39.6	-1.71	34.1	1440
26.2	7.0	-1.66	33.0	1439	27.0	42.5	-1.65	34.1	1441
26.2	7.2	-1.66	33.0	1439	27.1	51.2	-1.61	34.2	1441
26.2	7.8	-1.67	33.0	1439	27.2	57.7	-1.49	34.2	1442
26.2	12.1	-1.67	33.0	1439	27.2	67.3	-1.52	34.2	1442
26.1	18.2	-1.71	33.0	1439	27.1	70.7	-1.57	34.2	1442
26.1	23.7	-1.77	33.0	1438	27.1	81.1	-1.65	34.2	1441
26.2	29.2	-1.77	33.1	1439	27.1	84.7	-1.71	34.2	1441
26.5	34.7	-1.78	33.6	1439	27.1	96.4	-1.72	34.2	1441
26.5	40.6	-1.78	33.6	1439	27.1	100.6	-1.71	34.2	1442
26.7	46.6	-1.74	33.7	1440	27.1	104.5	-1.71	34.2	1442
26.7	51.9	-1.77	33.7	1440	27.3	112.2	-1.49	34.3	1443
26.7	57.1	-1.79	33.9	1440	27.6	120.5	-1.15	34.3	1445
26.8	62.5	-1.75	34.0	1440	28.4	128.5	-0.28	34.5	1449
27.0	68.1	-1.63	34.0	1441	28.9	136.5	0.26	34.5	1452
27.1	73.4	-1.55	34.0	1442	29.3	144.5	0.64	34.5	1454
27.1	80.6	-1.52	34.1	1442	29.7	148.5	1.08	34.6	1456
27.0	88.4	-1.78	34.1	1441	30.0	163.9	1.36	34.6	1457
27.0	95.6	-1.70	34.2	1441	30.1	167.7	1.40	34.7	1458
27.1	102.4	-1.58	34.2	1442	30.2	171.4	1.54	34.7	1458
27.1	107.9	-1.67	34.2	1442	30.3	175.1	1.60	34.7	1459
27.3	112.8	-1.45	34.2	1443	30.3	182.4	1.64	34.7	1459
27.4	117.7	-1.36	34.2	1443	30.3	189.6	1.66	34.7	1459
28.1	122.6	-0.55	34.3	1448	30.4	193.2	1.67	34.7	1459
28.3	127.5	-0.33	34.4	1449	30.4	200.2	1.72	34.7	1460
28.8	133.2	0.21	34.4	1451	30.4	210.3	1.74	34.7	1460
29.2	140.0	0.53	34.5	1453	30.4	213.5	1.76	34.7	1460
29.5	147.0	0.84	34.5	1455	30.4	216.7	1.74	34.7	1460
29.7	154.0	1.03	34.6	1456	30.3	223.2	1.57	34.7	1459
29.7	161.2	1.08	34.6	1456	30.4	226.4	1.67	34.7	1460
29.8	168.2	1.18	34.6	1457	30.4	232.8	1.65	34.7	1460
29.9	175.1	1.31	34.6	1457	30.4	236.0	1.66	34.7	1460
30.1	181.8	1.44	34.6	1458	30.4	239.1	1.68	34.7	1460
30.2	188.4	1.51	34.6	1458	30.5	245.4	1.74	34.7	1460
29.9	194.8	1.27	34.6	1457	30.5	248.5	1.75	34.7	1461
29.9	201.2	1.21	34.6	1457	30.5	251.6	1.76	34.7	1461
29.8	207.6	1.09	34.6	1457	30.5	254.7	1.76	34.7	1461
29.9	213.8	1.14	34.6	1457	30.5	257.8	1.75	34.7	1461
29.9	220.0	1.17	34.6	1457	30.5	263.9	1.75	34.7	1461
29.8	226.2	1.07	34.6	1457	30.5	266.9	1.74	34.7	1461
29.8	232.3	1.12	34.6	1457	30.4	272.9	1.71	34.7	1461
29.8	238.1	1.03	34.6	1457	30.4	278.9	1.70	34.7	1461
29.8	244.2	1.01	34.6	1457	30.4	284.9	1.69	34.7	1461
30.0	250.1	1.30	34.7	1458	30.4	287.9	1.69	34.7	1461
30.0	256.0	1.23	34.7	1458	30.4	290.9	1.68	34.7	1461
30.1	261.8	1.31	34.7	1459	30.4	293.9	1.65	34.7	1461
30.1	267.6	1.37	34.7	1459	30.4	302.9	1.62	34.7	1461
30.1	273.4	1.32	34.7	1459	30.4	305.7	1.61	34.7	1461
30.1	279.1	1.31	34.7	1459	30.4	308.5	1.60	34.7	1461
30.0	284.8	1.24	34.7	1459	30.3	310.2	1.58	34.7	1461
30.0	290.2	1.18	34.7	1459	30.3	310.4	1.58	34.7	1461
29.9	295.8	1.16	34.7	1459	30.3	310.0	1.58	34.7	1461
29.9	301.2	1.14	34.7	1459					
29.9	306.8	1.12	34.7	1459					
29.9	312.5	1.07	34.7	1458					
29.9	318.1	1.10	34.7	1459					
29.9	323.7	1.14	34.7	1459					
30.0	329.1	1.17	34.7	1459					
30.0	330.3	1.18	34.7	1459					
30.0	330.6	1.18	34.7	1459					

Cast 16A					Cast 16B					Cast 16C				
Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.
mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s
26.9	4.3	-1.65	33.9	1440	27.0	6.2	-1.64	34.1	1440	27.0	5.2	-1.62	34.1	1440
26.9	4.3	-1.65	33.9	1440	27.0	6.9	-1.65	34.1	1440	27.0	5.5	-1.63	34.1	1440
26.9	4.3	-1.65	33.9	1440	27.0	10.7	-1.63	34.1	1440	27.0	11.3	-1.62	34.1	1440
26.9	10.9	-1.65	34.0	1440	27.0	13.0	-1.63	34.1	1440	27.0	15.0	-1.61	34.1	1441
26.9	13.4	-1.64	34.0	1440	27.0	15.7	-1.63	34.1	1440	27.0	22.0	-1.61	34.1	1441
26.9	16.3	-1.64	34.0	1440	27.0	18.4	-1.63	34.1	1440	27.0	25.4	-1.61	34.1	1441
26.9	25.1	-1.64	34.0	1440	27.0	21.2	-1.63	34.1	1441	27.1	29.2	-1.60	34.1	1441
26.9	28.0	-1.63	34.0	1440	27.0	26.6	-1.62	34.1	1441	27.1	32.9	-1.59	34.1	1441
26.9	30.7	-1.62	34.0	1441	27.0	31.8	-1.63	34.1	1441	27.3	40.0	-1.38	34.2	1442
27.0	39.0	-1.59	34.0	1441	27.0	37.1	-1.63	34.1	1441	27.4	43.8	-1.33	34.2	1442
27.1	41.7	-1.47	34.1	1442	27.0	45.0	-1.67	34.1	1441	27.4	47.3	-1.26	34.3	1443
27.2	44.5	-1.46	34.1	1442	26.9	47.7	-1.71	34.1	1440	27.5	50.6	-1.18	34.3	1443
27.2	52.6	-1.46	34.1	1442	26.9	50.5	-1.76	34.1	1440	27.9	57.8	-.78	34.4	1445
27.2	55.3	-1.46	34.1	1442	27.0	53.2	-1.75	34.1	1441	28.4	61.4	-.39	34.5	1447
27.2	58.0	-1.45	34.1	1442	27.0	58.3	-1.72	34.1	1441	28.6	64.8	-.05	34.4	1449
27.3	66.0	-1.28	34.1	1443	27.1	60.9	-1.65	34.1	1441	28.7	68.2	.04	34.5	1450
27.4	68.6	-1.23	34.1	1443	27.3	66.1	-1.43	34.2	1442	29.2	75.1	.61	34.5	1452
27.5	71.3	-1.15	34.2	1444	27.5	68.7	-1.21	34.2	1443	29.4	78.5	.75	34.5	1453
28.1	78.8	-.50	34.2	1447	28.3	76.3	-.36	34.3	1448	29.4	81.8	.74	34.5	1453
28.3	81.3	-.22	34.3	1448	28.5	78.8	-.11	34.4	1449	28.9	85.1	.25	34.4	1451
28.4	84.1	-.19	34.3	1448	28.8	83.9	.18	34.4	1450	29.0	91.7	.33	34.6	1451
28.9	92.1	.37	34.4	1451	29.0	90.4	.43	34.4	1452	29.2	95.6	.49	34.6	1452
28.9	94.5	.39	34.4	1451	29.3	94.0	.69	34.5	1453	29.5	100.1	.82	34.6	1454
29.0	97.2	.42	34.4	1452	29.5	97.7	.86	34.6	1454	29.5	104.8	.86	34.6	1454
29.7	105.1	1.21	34.4	1455	29.6	104.9	1.02	34.6	1455	29.8	114.2	1.13	34.6	1455
29.9	107.7	1.40	34.4	1456	29.8	112.0	1.19	34.6	1456	29.8	118.8	1.10	34.6	1455
30.2	110.3	1.72	34.5	1458	29.8	115.5	1.23	34.6	1456	29.8	122.9	1.14	34.7	1456
29.8	117.8	1.32	34.4	1456	29.9	122.4	1.25	34.6	1456	30.0	127.5	1.31	34.7	1456
29.2	120.4	.64	34.4	1453	30.1	125.9	1.48	34.7	1457	30.3	140.9	1.66	34.7	1458
29.3	123.3	.69	34.5	1453	30.1	132.6	1.48	34.6	1457	30.3	145.2	1.66	34.7	1458
29.8	134.3	1.22	34.5	1456	30.0	139.2	1.38	34.6	1457	30.3	149.4	1.62	34.7	1458
30.0	138.0	1.44	34.5	1457	30.1	142.4	1.44	34.6	1457	30.3	157.8	1.61	34.7	1458
30.0	141.7	1.48	34.5	1457	30.0	151.4	1.36	34.6	1457	30.2	161.9	1.56	34.7	1458
29.2	152.4	.58	34.4	1453	29.9	154.4	1.29	34.6	1457	30.2	165.9	1.54	34.7	1458
29.2	156.0	.53	34.5	1453	29.9	157.3	1.27	34.6	1457	30.2	169.8	1.54	34.7	1458
29.2	159.7	.51	34.5	1453	29.9	160.2	1.20	34.6	1457	30.2	177.5	1.54	34.7	1458
29.5	170.3	.81	34.5	1455	29.9	168.6	1.25	34.6	1457	30.2	181.3	1.54	34.7	1458
29.7	173.7	1.08	34.6	1456	29.9	171.3	1.27	34.7	1457	30.2	185.0	1.52	34.7	1458
29.7	177.2	1.11	34.5	1456	30.0	174.0	1.35	34.7	1457	30.2	188.7	1.51	34.7	1458
30.0	187.3	1.44	34.6	1458	30.1	176.6	1.40	34.7	1458	30.1	196.0	1.43	34.7	1458
30.0	190.6	1.44	34.6	1458	30.1	187.5	1.42	34.7	1458	30.1	199.6	1.43	34.7	1458
30.0	193.5	1.43	34.6	1458	30.1	190.2	1.41	34.7	1458	30.1	203.1	1.39	34.7	1458
30.0	203.2	1.37	34.6	1458	30.1	192.8	1.42	34.7	1458	30.1	206.7	1.41	34.7	1458
30.0	206.4	1.36	34.6	1458	30.1	195.5	1.41	34.7	1458	30.1	213.5	1.37	34.7	1458
30.0	209.5	1.39	34.6	1458	30.1	200.7	1.45	34.7	1458	30.1	216.9	1.34	34.7	1458
30.1	217.6	1.49	34.6	1459	30.0	205.8	1.35	34.7	1458	30.0	220.3	1.27	34.7	1458
30.1	220.7	1.51	34.6	1459	30.0	208.4	1.28	34.7	1458	29.9	223.5	1.19	34.7	1458
30.1	223.6	1.50	34.6	1459	30.0	210.9	1.25	34.7	1458	30.1	230.2	1.33	34.7	1458
30.0	232.6	1.35	34.6	1458	29.9	215.9	1.15	34.7	1457	30.1	233.5	1.42	34.7	1459
30.0	235.5	1.39	34.6	1458	29.8	220.8	1.09	34.7	1457	30.1	236.8	1.41	34.7	1459
30.0	238.5	1.37	34.6	1458	29.8	225.7	1.12	34.7	1457	30.1	246.4	1.38	34.7	1459
30.0	247.1	1.34	34.6	1458	29.8	230.4	1.09	34.7	1457	30.1	249.6	1.33	34.7	1459
30.0	249.9	1.35	34.6	1459	29.8	232.8	1.10	34.7	1457	30.1	252.8	1.33	34.7	1459
30.0	252.8	1.35	34.6	1459	29.8	235.3	1.09	34.7	1457	30.1	256.0	1.34	34.7	1459
30.0	261.3	1.33	34.5	1459	29.8	240.0	1.07	34.7	1457	30.1	262.3	1.38	34.7	1459
30.0	264.1	1.32	34.6	1459	29.8	244.7	1.07	34.7	1457	30.1	265.4	1.37	34.7	1459
29.9	266.9	1.30	34.6	1459	29.9	247.1	1.10	34.7	1458	30.1	268.6	1.36	34.7	1459
30.0	275.2	1.33	34.6	1459	29.9	251.8	1.13	34.7	1458	30.1	271.7	1.34	34.7	1459
30.0	278.0	1.34	34.6	1459	29.9	254.1	1.14	34.7	1458	30.1	281.0	1.29	34.7	1459
30.0	280.7	1.33	34.6	1459	30.0	258.8	1.22	34.7	1458	30.1	284.1	1.29	34.7	1459
30.0	287.9	1.29	34.6	1459	30.0	263.4	1.30	34.7	1459	30.1	287.2	1.29	34.7	1459
30.0	288.1	1.29	34.6	1459	30.1	265.7	1.31	34.7	1459	30.1	293.3	1.30	34.7	1459
					30.1	268.0	1.31	34.7	1459	30.1	296.4	1.30	34.7	1459
					30.0	274.5	1.26	34.7	1459	30.1	299.4	1.29	34.7	1459
					30.0	274.8	1.26	34.7	1459	30.1	302.5	1.29	34.7	1459
										30.1	308.5	1.29	34.7	1459
										30.1	311.3	1.29	34.7	1459
										30.1	312.2	1.29	34.7	1459



Cast 17A						Cast 17B						Cast 17C					
Cond.	Pres.	Temp.	Sal.	Snd.Spd.		Cond.	Pres.	Temp.	Sal.	Snd.Spd.		Cond.	Pres.	Temp.	Sal.	Snd.Spd.	
mS/cm	dbars	°C	ppt	m/s		mS/cm	dbars	°C	ppt	m/s		mS/cm	dbars	°C	ppt	m/s	
26.0	4.7	-1.73	32.8	1438		26.3	6.0	-1.76	33.2	1438		26.9	5.3	-1.75	34.1	1440	
26.0	7.1	-1.73	32.8	1438		26.3	5.7	-1.76	33.2	1438		26.9	6.1	-1.75	34.1	1440	
26.0	13.3	-1.73	32.8	1438		26.3	12.1	-1.76	33.2	1439		26.9	15.9	-1.73	34.1	1440	
26.0	15.9	-1.73	32.8	1438		26.3	14.7	-1.76	33.2	1439		26.9	24.9	-1.73	34.1	1440	
26.1	18.4	-1.73	33.0	1438		26.3	20.5	-1.75	33.2	1439		27.0	38.0	-1.73	34.1	1440	
26.6	23.7	-1.65	33.5	1440		26.3	23.1	-1.75	33.2	1439		27.0	52.0	-1.74	34.2	1441	
26.6	29.0	-1.79	33.7	1439		26.3	28.8	-1.75	33.3	1439		27.0	54.8	-1.74	34.2	1441	
26.6	34.1	-1.81	33.8	1439		26.4	31.5	-1.74	33.3	1439		27.0	57.5	-1.74	34.2	1441	
26.6	36.6	-1.82	33.8	1439		26.5	36.7	-1.67	33.5	1440		27.5	82.5	-1.32	34.3	1443	
26.6	39.2	-1.82	33.8	1439		26.8	40.2	-1.55	33.7	1441		27.5	85.3	-1.30	34.3	1443	
26.6	44.6	-1.82	33.8	1440		27.2	50.7	-1.25	33.9	1443		27.5	88.1	-1.28	34.3	1444	
26.7	47.4	-1.81	33.8	1440		27.4	55.9	-1.11	34.0	1443		28.2	101.6	-1.54	34.4	1447	
26.7	55.4	-1.78	33.8	1440		27.3	58.6	-1.34	34.1	1443		29.2	114.4	.49	34.6	1453	
26.7	58.8	-1.79	33.9	1440		27.1	64.1	-1.56	34.1	1442		29.5	121.9	.76	34.6	1454	
26.7	62.6	-1.78	33.9	1440		27.2	66.8	-1.53	34.1	1442		29.9	130.9	1.21	34.7	1456	
26.8	68.9	-1.77	33.9	1440		27.2	72.1	-1.50	34.1	1442		30.0	134.4	1.31	34.7	1457	
26.8	72.5	-1.79	33.9	1440		27.1	74.8	-1.57	34.2	1442		30.3	158.8	1.61	34.8	1458	
26.8	76.0	-1.80	33.9	1440		27.4	80.5	-1.24	34.2	1443		30.3	162.3	1.60	34.8	1458	
26.8	86.5	-1.80	34.0	1441		27.5	83.3	-1.21	34.2	1444		30.3	172.3	1.58	34.8	1459	
26.8	90.0	-1.79	34.0	1441		27.4	88.6	-1.27	34.2	1443		30.3	181.8	1.55	34.8	1459	
26.8	97.3	-1.79	34.0	1441		27.3	96.7	-1.46	34.3	1443		30.3	197.5	1.62	34.8	1459	
26.8	100.9	-1.81	34.0	1441		27.2	99.5	-1.51	34.2	1442		30.4	212.6	1.67	34.8	1460	
26.8	104.5	-1.82	34.0	1441		27.2	105.6	-1.64	34.3	1442		30.4	215.5	1.62	34.8	1459	
26.8	111.8	-1.81	34.0	1441		27.3	109.0	-1.55	34.3	1443		30.4	218.4	1.70	34.8	1460	
26.9	119.1	-1.77	34.0	1441		27.2	116.1	-1.62	34.3	1442		30.3	243.7	1.49	34.8	1459	
26.9	126.6	-1.77	34.0	1441		27.8	119.8	-1.18	34.5	1445		30.2	246.5	1.42	34.8	1459	
26.9	130.2	-1.76	34.0	1442		27.8	127.3	-.96	34.4	1446		30.2	249.2	1.41	34.8	1459	
26.9	133.9	-1.75	34.0	1442		28.0	131.0	-.84	34.4	1446		30.2	262.5	1.41	34.8	1459	
27.0	141.3	-1.68	34.0	1442		28.5	138.2	-.26	34.5	1449		30.2	275.5	1.40	34.8	1459	
27.4	145.0	-1.26	34.2	1444		28.6	141.7	-.10	34.5	1450		30.2	283.3	1.41	34.8	1460	
27.3	156.1	-1.44	34.2	1444		29.1	152.4	.38	34.6	1453		30.2	290.9	1.38	34.8	1460	
27.3	159.6	-1.45	34.2	1444		29.5	159.5	.74	34.6	1454		30.2	293.4	1.35	34.8	1460	
27.6	163.1	-1.13	34.2	1445		29.6	162.9	.84	34.6	1455		30.2	311.0	1.33	34.8	1460	
30.4	173.6	1.90	34.5	1460		29.7	169.7	1.01	34.7	1456		30.2	313.4	1.33	34.8	1460	
30.6	177.0	2.08	34.6	1461		29.9	173.0	1.17	34.7	1457		30.3	320.8	1.45	34.8	1460	
30.9	187.0	2.42	34.6	1462		30.1	179.6	1.39	34.7	1458		30.3	328.1	1.45	34.8	1461	
30.9	190.3	2.42	34.6	1462		30.2	182.8	1.48	34.7	1458		30.2	340.2	1.39	34.8	1460	
30.9	200.0	2.42	34.6	1462		30.3	189.1	1.57	34.7	1459		30.0	352.3	1.11	34.8	1459	
30.9	203.1	2.42	34.6	1463		30.3	192.3	1.58	34.7	1459		30.0	354.7	1.10	34.8	1460	
30.9	209.4	2.42	34.6	1463		30.4	198.6	1.67	34.7	1459		30.0	357.1	1.09	34.8	1459	
30.9	215.5	2.42	34.6	1463		30.4	210.4	1.71	34.8	1460		30.0	378.4	1.06	34.8	1460	
30.9	221.5	2.42	34.6	1463		30.5	216.4	1.73	34.8	1460		30.0	380.7	1.07	34.8	1460	
30.9	224.5	2.43	34.6	1463		30.4	219.2	1.70	34.8	1460		30.0	383.0	1.07	34.8	1460	
30.9	233.3	2.42	34.6	1463		30.4	224.5	1.63	34.8	1460		30.0	394.7	1.10	34.8	1460	
30.9	244.9	2.42	34.6	1463		30.3	232.9	1.53	34.8	1459		30.2	297.7	1.30	34.8	1459	
30.9	247.7	2.42	34.6	1463		30.3	235.7	1.57	34.8	1460		30.2	270.8	1.40	34.8	1459	
30.9	250.6	2.41	34.6	1463		30.4	241.4	1.65	34.8	1460		30.2	249.8	1.42	34.8	1459	
30.9	256.2	2.41	34.6	1463		30.4	244.1	1.65	34.8	1460		30.4	231.0	1.62	34.8	1460	
30.9	259.0	2.41	34.6	1463		30.2	251.5	1.43	34.8	1459		30.3	187.0	1.54	34.7	1459	
30.9	270.1	2.40	34.6	1464		30.2	257.0	1.45	34.8	1459		30.3	171.8	1.58	34.7	1459	
30.9	272.8	2.41	34.6	1464		30.2	264.9	1.40	34.8	1459		30.3	151.8	1.59	34.7	1458	
31.0	278.2	2.44	34.6	1464		30.2	267.6	1.39	34.8	1459		29.8	128.3	1.11	34.7	1456	
31.0	280.9	2.46	34.6	1464		30.1	272.8	1.32	34.8	1459		28.0	96.0	-.77	34.4	1446	
31.1	289.0	2.57	34.6	1465		30.1	280.6	1.31	34.8	1459		27.1	69.1	-1.65	34.2	1441	
31.2	294.3	2.63	34.6	1465		30.1	288.4	1.33	34.8	1459		27.1	66.2	-1.70	34.2	1441	
31.3	302.3	2.75	34.6	1466		30.1	296.0	1.31	34.8	1459		27.0	63.2	-1.71	34.2	1441	
31.4	304.9	2.81	34.7	1466		30.0	298.5	1.22	34.8	1459		26.9	16.6	-1.73	34.1	1440	
31.4	310.2	2.84	34.7	1466		30.0	303.6	1.16	34.8	1459		26.9	6.8	-1.74	34.1	1440	
31.5	320.6	2.91	34.7	1467		30.0	306.1	1.12	34.8	1459		26.9	7.6	-1.74	34.1	1440	
31.5	323.1	2.91	34.7	1467		30.0	313.6	1.15	34.8	1459							
31.5	325.7	2.91	34.7	1467		30.0	318.5	1.12	34.8	1459							
31.4	333.5	2.87	34.7	1467		30.0	326.0	1.18	34.8	1459							
31.4	336.1	2.83	34.7	1467		30.0	328.5	1.19	34.8	1459							
31.2	346.3	2.58	34.7	1466		30.1	340.8	1.19	34.8	1460							
31.1	351.3	2.50	34.7	1465		30.1	343.3	1.22	34.8	1460							
31.1	353.9	2.45	34.7	1465		30.1	350.7	1.23	34.8	1460							
30.8	361.3	2.16	34.6	1464		30.2	352.8	1.29	34.8	1460							
30.8	363.7	2.13	34.6	1464													

Cast 18A					Cast 18B					Cast 18C				
Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.
mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s
25.5	3.7	-1.77	32.2	1437	26.8	5.8	-1.79	34.0	1439	26.8	26.6	-1.80	33.9	1440
25.5	3.9	-1.71	32.1	1437	26.8	7.8	-1.79	34.0	1439	26.8	35.9	-1.78	34.0	1440
25.5	3.9	-1.73	32.2	1437	26.8	12.0	-1.78	34.0	1439	26.8	38.9	-1.78	34.0	1440
25.6	4.0	-1.76	32.2	1437	26.8	21.8	-1.78	34.0	1440	26.9	48.2	-1.77	34.0	1440
25.6	4.0	-1.72	32.2	1437	26.8	24.5	-1.78	34.0	1440	26.9	51.3	-1.77	34.0	1440
25.6	4.0	-1.61	32.1	1438	26.8	27.1	-1.78	34.0	1440	26.9	60.4	-1.76	34.0	1440
25.6	4.0	-1.76	32.3	1437	26.8	37.9	-1.77	34.0	1440	27.0	63.5	-1.68	34.1	1441
25.6	4.0	-1.75	32.3	1437	26.8	43.9	-1.77	34.0	1440	27.2	72.8	-1.51	34.1	1442
26.8	4.0	-1.73	33.9	1439	26.8	46.9	-1.77	34.0	1440	27.4	75.8	-1.28	34.2	1443
26.8	3.9	-1.77	33.9	1439	26.9	58.9	-1.73	34.1	1441	28.0	85.1	-.64	34.3	1446
26.8	4.1	-1.77	33.9	1439	26.9	61.9	-1.73	34.1	1441	28.6	97.5	-.01	34.4	1450
26.8	4.1	-1.75	33.9	1439	26.9	67.9	-1.74	34.1	1441	28.7	100.6	.13	34.4	1450
26.8	4.1	-1.77	33.9	1439	27.3	79.8	-1.42	34.2	1443	28.9	109.9	.33	34.4	1451
26.8	4.2	-1.69	33.9	1440	27.3	82.8	-1.38	34.2	1443	29.1	122.2	.49	34.5	1452
26.8	4.2	-1.68	33.9	1440	27.3	85.7	-1.33	34.2	1443	29.2	125.2	.63	34.5	1453
26.8	4.2	-1.71	33.9	1440	27.8	97.6	-.85	34.2	1446	29.6	134.3	1.00	34.5	1455
26.8	4.2	-1.68	33.9	1440	28.3	106.4	-.33	34.3	1448	29.7	137.3	1.06	34.6	1455
26.8	7.4	-1.79	34.0	1439	28.8	118.2	.13	34.4	1451	30.1	146.4	1.48	34.6	1457
26.8	14.3	-1.78	34.0	1439	28.9	120.9	.30	34.4	1452	30.1	149.4	1.52	34.6	1458
26.8	28.6	-1.78	34.0	1440	29.1	126.6	.54	34.5	1453	30.1	161.6	1.49	34.6	1458
26.8	43.2	-1.76	34.0	1440	29.8	141.5	1.27	34.5	1456	30.0	168.5	1.42	34.6	1458
26.9	49.8	-1.73	34.0	1440	30.0	144.5	1.37	34.6	1457	30.0	170.5	1.41	34.6	1458
26.9	60.5	-1.74	34.1	1441	30.2	156.7	1.65	34.6	1458	30.0	179.1	1.37	34.6	1458
27.0	66.6	-1.69	34.1	1441	30.3	162.8	1.67	34.6	1459	29.9	181.9	1.29	34.6	1457
27.3	78.8	-1.34	34.1	1443	30.2	178.0	1.60	34.6	1459	29.7	191.4	1.07	34.6	1456
27.7	92.2	-.88	34.2	1445	30.2	181.0	1.54	34.6	1458	29.7	194.3	1.08	34.6	1456
28.2	98.8	-.40	34.3	1448	30.1	187.0	1.49	34.6	1458	29.8	202.7	1.14	34.6	1457
28.3	105.5	-.27	34.3	1448	30.1	198.9	1.49	34.6	1458	29.8	205.6	1.16	34.6	1457
29.2	125.2	.68	34.4	1453	30.1	204.5	1.48	34.6	1458	29.9	214.2	1.24	34.6	1458
29.6	131.6	1.05	34.5	1455	30.0	215.8	1.37	34.6	1458	29.8	226.0	1.11	34.6	1457
30.0	138.1	1.44	34.5	1457	30.0	221.5	1.34	34.6	1458	29.8	229.0	1.12	34.6	1457
30.1	144.6	1.58	34.6	1458	30.0	224.3	1.33	34.6	1458	29.9	237.9	1.15	34.6	1458
30.1	163.8	1.55	34.6	1458	29.9	239.0	1.21	34.6	1458	29.9	240.9	1.15	34.6	1458
30.1	170.0	1.58	34.6	1458	29.9	244.8	1.21	34.6	1458	29.8	250.0	1.10	34.6	1457
30.1	176.2	1.49	34.6	1458	30.0	256.4	1.24	34.6	1458	29.8	253.0	1.10	34.6	1458
30.1	188.6	1.47	34.6	1458	29.9	259.3	1.20	34.6	1458	29.7	262.3	1.02	34.6	1457
30.0	200.6	1.41	34.6	1458	29.8	274.4	1.00	34.6	1457	29.7	265.5	1.01	34.6	1457
30.1	206.6	1.43	34.6	1458	29.7	280.4	.99	34.6	1458	29.7	275.1	1.01	34.6	1458
30.1	218.6	1.46	34.6	1459	29.7	283.4	.99	34.6	1458	29.8	278.2	1.02	34.6	1458
30.1	224.6	1.45	34.6	1459	29.8	295.5	1.06	34.6	1458	29.8	291.1	1.01	34.6	1458
30.0	236.7	1.34	34.6	1458	29.9	304.5	1.18	34.6	1459	29.7	300.7	.94	34.6	1458
30.0	248.8	1.29	34.6	1458	30.0	316.5	1.23	34.7	1459	29.7	303.9	.97	34.6	1458
30.0	254.8	1.28	34.6	1458	30.0	319.5	1.23	34.7	1459	29.8	313.5	1.00	34.6	1458
29.9	260.7	1.24	34.6	1458	30.0	322.5	1.22	34.7	1459	29.8	316.8	1.02	34.6	1458
29.8	278.8	1.07	34.6	1458	29.8	340.7	1.06	34.6	1459	29.9	326.3	1.08	34.6	1459
29.7	284.7	1.01	34.6	1458	29.8	343.7	1.04	34.6	1459	29.8	329.6	1.08	34.6	1459
29.9	290.7	1.14	34.6	1458	29.8	355.8	1.00	34.7	1459	29.8	339.2	1.02	34.6	1459
29.9	296.6	1.18	34.6	1459	29.8	358.7	1.01	34.6	1459	29.8	342.4	1.02	34.6	1459
29.8	314.3	1.08	34.6	1458	29.7	376.0	.86	34.6	1459	29.8	352.0	.96	34.6	1459
29.8	320.3	1.06	34.6	1458	29.6	378.8	.79	34.6	1458	29.7	364.7	.93	34.6	1459
29.8	326.2	1.08	34.6	1459	29.6	381.7	.79	34.7	1458	29.7	367.9	.92	34.6	1459
29.8	338.1	1.07	34.6	1459	29.7	393.5	.86	34.6	1459	29.7	377.4	.91	34.6	1459
29.8	350.1	1.01	34.6	1459	29.8	402.4	.94	34.6	1459	29.7	380.5	.90	34.6	1459
29.8	356.1	1.00	34.6	1459	29.6	413.3	.75	34.6	1459	29.7	389.8	.91	34.6	1459
29.8	367.8	1.00	34.6	1459	29.5	415.8	.69	34.6	1458	29.7	392.8	.92	34.6	1459
29.8	373.7	1.01	34.6	1459	29.5	420.8	.66	34.6	1458	29.7	401.5	.87	34.6	1459
29.8	385.2	1.01	34.6	1459	29.7	433.2	.88	34.6	1459	29.7	404.6	.83	34.6	1459
29.7	396.8	.93	34.6	1459	29.6	435.7	.75	34.6	1459	29.7	413.7	.82	34.6	1459
29.8	402.6	.97	34.6	1459	29.5	445.4	.61	34.6	1459	29.7	416.8	.82	34.6	1459
29.9	408.3	1.09	34.6	1460	29.5	450.2	.58	34.6	1458	29.6	428.8	.75	34.6	1459
29.6	425.6	.80	34.6	1459	29.4	461.9	.54	34.6	1458	29.7	437.5	.80	34.6	1459
29.8	431.5	.98	34.7	1460	29.4	464.1	.53	34.6	1458	29.7	440.4	.80	34.6	1459
29.8	437.4	1.03	34.6	1460	29.4	468.4	.52	34.6	1459	29.6	448.9	.75	34.6	1459
29.7	443.2	.91	34.6	1460	29.4	477.0	.50	34.6	1459	29.6	451.7	.75	34.6	1459
29.5	459.8	.65	34.6	1459						29.6	463.0	.75	34.6	1459
29.5	464.5	.65	34.6	1459						29.6	471.1	.70	34.6	1459
29.4	468.6	.57	34.6	1459						29.6	473.6	.70	34.7	1459
29.5	476.5	.60	34.6	1459						29.6	481.2	.68	34.6	1459

Cast 18D					Cast 18E					Cast 19B				
Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.
mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s
26.9	33.1	-1.77	34.0	1440	26.9	11.2	-1.82	34.1	1439	26.8	2.2	-2.07	34.3	1438
26.9	36.2	-1.77	34.1	1440	26.9	14.2	-1.82	34.1	1440	26.9	3.2	-1.97	34.3	1439
26.9	39.3	-1.77	34.1	1440	26.9	20.5	-1.82	34.1	1440	26.9	3.1	-1.93	34.3	1439
26.9	42.4	-1.77	34.1	1440	26.9	23.7	-1.82	34.1	1440	26.9	3.2	-1.83	34.2	1439
26.9	45.5	-1.77	34.1	1440	26.9	30.0	-1.80	34.2	1440	26.9	4.3	-1.83	34.2	1439
26.9	48.6	-1.76	34.1	1440	27.0	33.3	-1.78	34.2	1440	26.9	4.2	-1.82	34.2	1439
26.9	51.6	-1.76	34.1	1440	27.0	39.8	-1.76	34.3	1440	26.9	4.3	-1.83	34.2	1439
26.9	54.7	-1.75	34.1	1440	27.0	50.1	-1.76	34.3	1441	26.9	4.3	-1.83	34.2	1439
26.9	60.7	-1.75	34.1	1441	27.1	53.5	-1.75	34.3	1441	26.9	4.3	-1.82	34.2	1439
26.9	63.7	-1.74	34.1	1441	27.1	60.3	-1.76	34.3	1441	26.9	4.3	-1.83	34.2	1439
27.0	72.9	-1.68	34.1	1441	27.1	63.8	-1.76	34.3	1441	26.9	4.3	-1.82	34.2	1439
27.1	75.9	-1.64	34.1	1441	27.1	70.6	-1.71	34.3	1441	26.9	4.3	-1.82	34.2	1439
27.5	85.2	-1.21	34.3	1444	27.3	74.1	-1.57	34.4	1442	26.9	4.3	-1.82	34.2	1439
27.9	91.6	-0.79	34.3	1446	28.0	91.3	-0.85	34.5	1446	26.9	4.3	-1.81	34.2	1439
28.4	100.9	-0.20	34.3	1449	28.4	94.5	-0.46	34.5	1448	26.9	4.3	-1.81	34.2	1439
28.6	104.1	-0.05	34.4	1450	28.7	100.9	-0.07	34.6	1450	26.9	4.3	-1.81	34.2	1439
29.0	113.4	0.37	34.4	1452	28.7	104.0	-0.04	34.6	1450	26.9	4.3	-1.81	34.2	1439
29.0	119.7	0.41	34.4	1452	28.7	110.0	-0.06	34.5	1450	26.9	4.3	-1.81	34.2	1439
29.2	128.9	0.55	34.5	1453	28.6	119.0	-0.23	34.6	1449	26.9	8.7	-1.81	34.2	1440
29.6	131.9	0.89	34.6	1455	29.6	127.7	0.76	34.8	1454	26.9	10.1	-1.81	34.2	1440
30.1	141.1	1.48	34.6	1457	29.8	130.6	1.09	34.7	1456	27.0	12.1	-1.81	34.2	1440
30.2	147.2	1.58	34.6	1458	30.0	136.3	1.25	34.8	1457	27.0	22.4	-1.81	34.3	1440
30.1	156.3	1.52	34.6	1458	30.1	139.3	1.29	34.8	1457	27.0	26.9	-1.80	34.3	1440
30.1	159.4	1.49	34.6	1458	30.5	147.9	1.72	34.9	1459	27.0	31.4	-1.80	34.3	1440
30.0	168.7	1.40	34.6	1457	30.5	153.7	1.71	34.9	1459	27.1	44.8	-1.78	34.3	1441
30.0	174.8	1.37	34.6	1457	30.5	162.4	1.69	34.8	1459	27.1	53.7	-1.75	34.3	1441
30.0	183.9	1.39	34.6	1458	30.4	165.2	1.63	34.8	1459	27.1	67.0	-1.72	34.3	1441
30.0	186.9	1.33	34.6	1457	30.3	171.0	1.52	34.8	1458	27.1	71.5	-1.69	34.3	1441
29.8	195.9	1.11	34.6	1457	30.3	179.6	1.45	34.8	1458	27.2	75.6	-1.69	34.3	1441
29.8	201.9	1.11	34.6	1457	30.1	182.4	1.32	34.8	1458	27.5	88.1	-1.34	34.4	1444
29.9	211.0	1.16	34.6	1457	30.1	188.1	1.25	34.8	1457	28.2	96.4	-0.61	34.5	1447
29.9	214.0	1.24	34.6	1458	30.0	196.6	1.15	34.8	1457	28.9	113.2	0.07	34.6	1451
29.9	223.3	1.17	34.6	1457	30.0	199.4	1.13	34.8	1457	28.9	117.3	0.16	34.6	1451
29.9	229.4	1.17	34.6	1458	30.1	207.8	1.20	34.9	1458	29.3	129.6	0.52	34.7	1453
29.8	238.6	1.13	34.6	1457	30.1	213.4	1.19	34.8	1458	29.4	133.6	0.64	34.7	1454
29.9	241.6	1.13	34.7	1458	30.1	216.2	1.20	34.8	1458	29.7	137.7	0.92	34.8	1455
29.8	250.7	1.08	34.6	1457	30.2	222.0	1.31	34.9	1458	30.1	149.7	1.26	34.8	1457
29.8	256.7	1.06	34.6	1457	30.2	230.6	1.31	34.9	1458	30.1	153.8	1.32	34.8	1457
29.8	265.8	1.03	34.6	1457	30.1	239.0	1.19	34.8	1458	30.4	170.0	1.55	34.9	1459
29.8	268.9	1.02	34.7	1458	30.0	241.9	1.11	34.9	1458	30.3	174.0	1.52	34.9	1459
29.8	278.1	1.04	34.7	1458	30.0	247.5	1.08	34.9	1458	30.4	178.0	1.51	34.9	1459
29.8	284.2	1.06	34.7	1458	30.0	250.3	1.07	34.9	1458	30.4	190.1	1.51	34.9	1459
29.9	293.3	1.09	34.7	1458	30.0	255.9	1.05	34.9	1458	30.1	193.9	1.29	34.9	1458
29.9	296.4	1.10	34.7	1458	30.0	267.2	1.04	34.9	1458	30.1	197.7	1.26	34.9	1458
29.9	305.7	1.12	34.7	1459	29.9	272.8	1.01	34.9	1458	30.1	209.2	1.21	34.9	1458
29.9	311.9	1.11	34.7	1459	29.9	275.7	1.02	34.9	1458	30.2	216.8	1.27	34.9	1458
29.8	321.2	1.05	34.7	1459	29.9	281.3	0.99	34.9	1458	30.4	232.1	1.49	34.9	1460
29.8	324.3	1.03	34.7	1458	29.9	284.1	1.01	34.9	1458	30.4	235.8	1.53	34.9	1460
29.8	333.6	0.98	34.7	1458	29.9	289.8	1.00	34.9	1458	30.4	247.7	1.45	34.9	1459
29.8	339.9	0.95	34.7	1458	30.0	301.0	1.07	34.9	1459	30.4	251.9	1.48	34.9	1460
29.8	349.2	0.94	34.7	1459	30.0	306.6	1.11	34.9	1459	30.1	272.9	1.12	34.9	1459
29.8	352.3	0.94	34.7	1459	30.1	309.5	1.12	34.9	1459	30.2	277.1	1.23	34.9	1459
29.7	361.4	0.89	34.7	1459	30.0	315.2	1.10	34.9	1459	30.3	290.0	1.33	34.9	1460
29.8	367.5	0.92	34.7	1459	30.0	318.0	1.08	34.9	1459	30.3	294.4	1.31	34.9	1460
29.7	376.7	0.89	34.7	1459	30.0	326.6	1.01	34.9	1459	30.2	298.7	1.27	34.9	1459
29.7	379.7	0.86	34.7	1459	29.9	336.3	0.96	34.9	1459	30.0	311.5	1.05	34.9	1459
29.7	388.8	0.83	34.7	1459	29.9	342.8	0.93	34.9	1459	30.1	316.9	1.05	34.9	1459
29.7	394.8	0.86	34.7	1459	29.9	346.0	0.93	34.9	1459	30.2	341.0	1.21	34.9	1460
					29.8	352.5	0.87	34.9	1458	30.2	345.4	1.19	34.9	1460
					29.8	362.0	0.84	34.9	1459	30.2	363.3	1.14	35.0	1460
					29.8	365.2	0.84	34.9	1459	30.1	368.0	1.07	34.9	1460
					29.8	374.6	0.80	34.9	1459	30.2	381.8	1.14	35.0	1460
					29.8	380.5	0.81	34.9	1459	30.2	390.9	1.19	34.9	1461
					29.8	383.4	0.81	34.9	1459	30.2	404.4	1.16	35.0	1461
					29.8	392.2	0.81	34.9	1459	30.2	435.0	1.10	35.0	1461
					29.8	397.7	0.83	34.9	1459	30.1	452.1	1.07	35.0	1461
										30.1	469.6	0.99	35.0	1461
										30.1	474.0	0.99	35.0	1461
										30.1	478.3	0.98	35.0	1461

Cast 19C						Cast 20A						Cast 20B					
Cond.	Pres.	Temp.	Sal.	Snd.Spd.		Cond.	Pres.	Temp.	Sal.	Snd.Spd.		Cond.	Pres.	Temp.	Sal.	Snd.Spd.	
mS/cm	dbars	°C	ppt	m/s		mS/cm	dbars	°C	ppt	m/s		mS/cm	dbars	°C	ppt	m/s	
26.7	3.4	-1.80	33.9	1439		26.7	5.5	-1.77	33.9	1439		26.8	3.4	-1.79	33.9	1439	
26.8	7.3	-1.79	33.9	1439		26.7	11.4	-1.77	33.9	1439		26.8	4.9	-1.77	33.9	1439	
26.8	19.8	-1.78	33.9	1439		26.8	24.3	-1.76	34.0	1440		26.8	16.4	-1.77	33.9	1439	
26.8	24.0	-1.77	34.0	1440		26.9	30.1	-1.74	34.0	1440		26.8	20.8	-1.77	33.9	1440	
26.9	36.0	-1.74	34.1	1440		26.9	36.0	-1.73	34.0	1440		26.9	33.4	-1.77	34.0	1440	
27.0	40.0	-1.76	34.2	1440		26.9	42.2	-1.75	34.1	1440		26.9	37.2	-1.76	34.0	1440	
27.1	51.2	-1.69	34.3	1441		27.0	48.0	-1.74	34.1	1440		27.0	49.3	-1.68	34.2	1441	
27.1	54.8	-1.69	34.3	1441		27.0	59.4	-1.75	34.1	1440		27.0	53.7	-1.71	34.2	1441	
27.2	65.6	-1.66	34.3	1441		27.0	65.6	-1.77	34.1	1441		27.0	65.9	-1.73	34.2	1441	
27.1	69.0	-1.72	34.3	1441		27.0	71.6	-1.77	34.1	1441		27.1	69.6	-1.70	34.2	1441	
27.2	79.9	-1.64	34.4	1442		27.0	83.4	-1.76	34.2	1441		27.1	81.8	-1.62	34.2	1442	
27.3	83.4	-1.56	34.4	1442		27.2	89.7	-1.61	34.3	1443		27.2	85.9	-1.52	34.2	1442	
28.3	93.3	-1.43	34.5	1448		27.7	95.8	-1.98	34.3	1446		27.6	97.8	-1.09	34.3	1445	
28.5	96.4	-1.27	34.5	1449		28.4	101.4	-1.28	34.4	1449		27.8	101.3	-1.90	34.3	1446	
28.8	105.9	.02	34.6	1450		28.7	112.5	.09	34.4	1451		28.8	113.3	.08	34.5	1450	
28.9	109.0	.11	34.6	1451		29.1	118.7	.43	34.5	1452		28.9	117.3	.17	34.5	1451	
29.4	117.6	.63	34.7	1453		29.2	124.6	.58	34.5	1453		29.3	128.4	.63	34.6	1453	
29.4	120.4	.68	34.7	1454		29.4	130.6	.70	34.5	1454		29.5	131.7	.68	34.7	1454	
29.5	128.5	.73	34.7	1454		29.9	141.9	1.23	34.6	1456		30.0	142.4	1.27	34.7	1457	
29.4	131.0	.64	34.7	1454		30.0	147.2	1.36	34.6	1457		30.2	146.3	1.45	34.7	1458	
29.5	138.8	.69	34.7	1454		30.2	152.9	1.55	34.7	1458		30.4	158.1	1.68	34.8	1459	
29.5	141.3	.67	34.7	1454		30.3	163.9	1.69	34.7	1459		30.4	162.0	1.63	34.8	1459	
29.7	149.1	.85	34.8	1455		30.4	168.9	1.78	34.7	1459		30.5	172.6	1.77	34.8	1459	
29.7	151.6	.87	34.8	1455		30.5	174.4	1.85	34.7	1460		30.5	175.8	1.77	34.8	1460	
29.4	158.4	.51	34.8	1454		30.6	180.0	1.92	34.7	1460		30.6	186.5	1.92	34.8	1460	
29.4	160.6	.52	34.8	1454		30.6	185.5	1.94	34.7	1460		30.2	190.3	1.42	34.8	1458	
29.4	167.5	.54	34.8	1454		30.5	196.3	1.80	34.7	1460		30.3	201.6	1.53	34.8	1459	
29.4	169.7	.57	34.8	1454		30.3	211.9	1.59	34.7	1459		29.8	205.3	.95	34.7	1456	
29.5	176.1	.58	34.8	1454		30.3	217.2	1.63	34.7	1459		29.7	216.1	.82	34.8	1456	
29.5	178.1	.58	34.8	1454		30.2	222.3	1.46	34.7	1459		29.8	219.3	.95	34.8	1457	
29.5	183.9	.62	34.8	1455		30.2	227.2	1.44	34.7	1459		30.0	229.2	1.20	34.8	1458	
29.5	185.9	.62	34.8	1455		30.3	231.6	1.52	34.7	1459		30.0	232.8	1.18	34.8	1458	
29.5	192.1	.61	34.8	1455		30.3	236.2	1.55	34.7	1460		30.1	243.5	1.27	34.8	1458	
29.5	194.1	.61	34.8	1455		30.4	246.3	1.66	34.8	1460		30.1	246.7	1.24	34.8	1458	
29.5	199.9	.61	34.8	1455		30.3	256.5	1.51	34.8	1460		30.2	256.1	1.31	34.8	1459	
29.5	201.7	.60	34.8	1455		30.3	266.2	1.48	34.8	1460		30.1	259.5	1.25	34.8	1459	
29.5	207.2	.61	34.8	1455		30.3	270.6	1.57	34.8	1460		30.0	269.1	1.15	34.8	1458	
29.5	209.0	.60	34.8	1455		30.3	275.1	1.48	34.8	1460		29.9	272.6	1.08	34.8	1458	
29.5	214.2	.63	34.8	1455		30.2	280.0	1.37	34.8	1459		29.9	283.1	1.06	34.8	1458	
29.6	215.8	.69	34.8	1455		30.2	284.5	1.41	34.8	1460		29.9	286.4	1.03	34.8	1458	
29.6	222.5	.70	34.8	1456		30.1	298.1	1.29	34.8	1459		29.9	296.1	.99	34.8	1458	
29.8	227.2	.88	34.8	1456		30.1	302.8	1.28	34.8	1459		29.9	299.5	1.00	34.8	1458	
29.8	228.7	.87	34.8	1456		30.1	307.6	1.24	34.7	1459		29.8	309.5	.91	34.8	1458	
29.8	233.7	.87	34.8	1457		30.1	312.3	1.26	34.8	1459		29.8	312.8	.91	34.8	1458	
29.8	235.2	.87	34.8	1457		30.1	317.0	1.28	34.8	1460		30.2	322.7	1.28	34.8	1460	
29.8	240.1	.85	34.8	1457		30.0	321.6	1.21	34.8	1459		30.3	325.7	1.39	34.9	1460	
29.8	241.6	.85	34.8	1457		30.1	326.1	1.30	34.8	1460		30.6	335.3	1.69	34.9	1462	
29.8	246.0	.83	34.8	1457		30.1	330.5	1.31	34.8	1460		30.6	338.6	1.70	34.9	1462	
29.8	247.5	.83	34.8	1457		30.3	344.0	1.42	34.8	1461		30.5	348.2	1.61	34.9	1462	
29.7	251.8	.81	34.8	1457		30.3	348.1	1.41	34.8	1461		30.3	351.3	1.44	34.9	1461	
29.7	257.1	.80	34.8	1457		30.2	352.2	1.40	34.8	1461		30.2	360.7	1.25	34.8	1460	
29.7	258.5	.80	34.8	1457		30.1	360.1	1.24	34.8	1460		30.0	372.9	1.01	34.8	1459	
29.8	264.8	.82	34.8	1457		30.1	364.5	1.21	34.8	1460		29.9	376.0	1.01	34.8	1459	
29.8	269.5	.83	34.9	1457		30.1	368.9	1.19	34.8	1460		30.0	384.9	1.08	34.8	1460	
29.8	271.1	.82	34.8	1457		30.1	377.5	1.19	34.8	1460		30.0	387.9	1.07	34.8	1460	
29.8	275.4	.85	34.9	1457		30.0	385.8	1.13	34.8	1460		30.1	396.9	1.13	34.8	1460	
29.8	276.9	.85	34.9	1457		30.0	390.0	1.10	34.8	1460		30.0	399.8	1.07	34.8	1460	
29.8	278.9	.85	34.9	1457		30.0	394.1	1.09	34.8	1460		30.0	408.1	1.07	34.8	1460	
29.8	282.8	.86	34.9	1457		30.0	398.2	1.09	34.8	1460		30.1	411.1	1.10	34.8	1460	
29.8	284.2	.85	34.9	1457		30.0	406.3	1.05	34.8	1460		30.0	422.8	1.07	34.8	1461	
29.8	288.6	.83	34.9	1457		30.0	414.4	1.07	34.8	1460		30.1	431.2	1.17	34.9	1461	
29.8	289.9	.85	34.9	1457		30.0	418.3	1.08	34.8	1460		30.2	434.0	1.19	34.9	1461	
29.8	293.9	.86	34.9	1457		30.0	426.2	1.12	34.8	1461		30.2	442.7	1.28	34.9	1462	
29.8	290.2	.85	34.8	1457		30.1	430.0	1.21	34.8	1461		30.2	445.6	1.27	34.9	1462	
29.8	268.5	.82	34.8	1457		30.1	433.8	1.21	34.8	1461		30.1	456.6	1.12	34.8	1461	
29.7	252.8	.81	34.8	1457		30.1	441.6	1.24	34.8	1462		30.2	464.9	1.19	34.9	1462	
29.8	247.7	.83	34.8	1457		30.1	446.6	1.22	34.8	1462		30.1	467.7	1.09	34.8	1461	
29.8	232.6	.88	34.8	1457								29.7	475.8	.71	34.8	1460	
29.5	214.0	.61	34.8	1455								29.7	478.6	.69	34.8	1460	

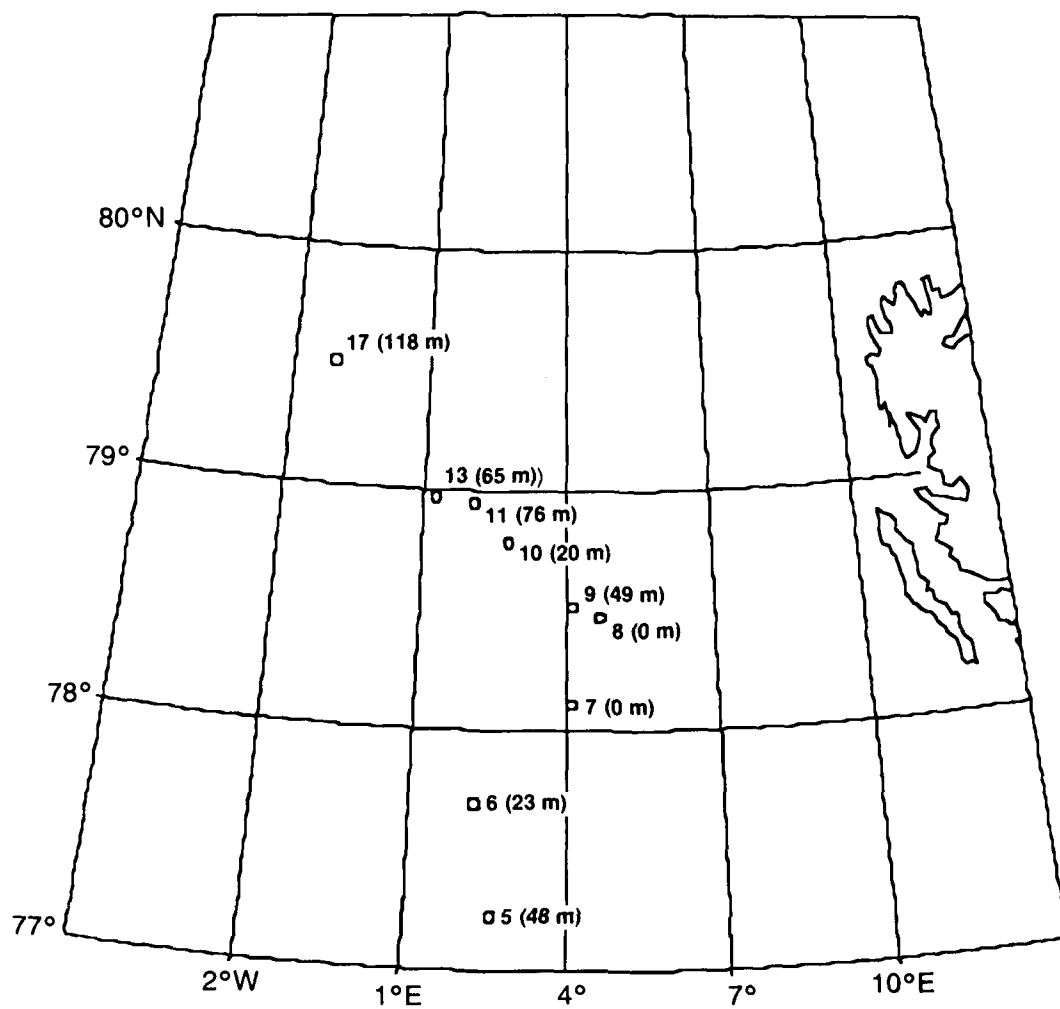
Cast 20C					Cast 20D					Cast 20E				
Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.	Cond.	Pres.	Temp.	Sal.	Snd.Spd.
mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s	mS/cm	dbars	°C	ppt	m/s
26.8	3.3	-1.81	34.0	1439	26.7	3.5	-1.81	33.9	1439	26.7	2.3	-1.81	33.8	1439
26.8	5.3	-1.78	33.9	1439	26.7	5.1	-1.79	33.9	1439	26.7	3.4	-1.81	33.9	1439
26.8	16.9	-1.78	33.9	1439	26.7	15.6	-1.79	33.9	1439	26.7	10.0	-1.80	33.9	1439
26.8	21.1	-1.78	33.9	1440	26.7	19.7	-1.79	33.9	1439	26.7	12.3	-1.80	33.9	1439
26.9	34.5	-1.78	34.1	1440	26.8	32.7	-1.78	33.9	1440	26.7	20.2	-1.79	33.9	1439
26.9	38.6	-1.76	34.1	1440	26.8	36.8	-1.78	34.0	1440	26.8	23.7	-1.79	33.9	1439
26.9	49.8	-1.79	34.2	1440	26.9	48.2	-1.79	34.1	1440	26.8	34.0	-1.78	34.0	1440
27.0	53.5	-1.79	34.2	1440	26.9	52.2	-1.79	34.1	1440	26.9	37.4	-1.78	34.0	1440
27.0	66.6	-1.76	34.2	1441	27.0	65.1	-1.77	34.2	1441	26.9	47.7	-1.80	34.1	1440
27.0	70.9	-1.76	34.2	1441	27.0	69.2	-1.74	34.2	1441	26.9	51.2	-1.79	34.1	1440
27.2	83.1	-1.61	34.3	1442	27.0	80.1	-1.72	34.2	1441	26.9	63.7	-1.80	34.1	1440
27.4	87.5	-1.40	34.3	1443	27.2	83.5	-1.52	34.3	1442	27.0	68.3	-1.79	34.1	1441
28.1	100.2	-1.61	34.4	1447	27.9	95.0	-1.84	34.3	1446	27.1	81.1	-1.74	34.2	1441
28.3	104.5	-1.47	34.4	1448	28.1	99.3	-1.62	34.4	1447	27.4	85.5	-1.69	34.2	1441
28.9	116.9	.19	34.6	1451	28.4	112.0	-.25	34.4	1449	28.1	99.2	-.83	34.3	1446
29.2	120.7	.42	34.6	1452	28.7	116.3	-.03	34.5	1450	28.3	103.7	-.62	34.4	1447
29.5	132.1	.77	34.7	1454	29.1	128.5	.43	34.6	1452	29.0	115.6	.13	34.5	1451
29.7	136.3	.96	34.7	1455	29.2	132.1	.79	34.6	1453	29.1	119.1	.29	34.5	1452
30.3	148.1	1.59	34.8	1458	29.9	143.0	1.20	34.7	1456	29.6	131.2	.67	34.6	1454
30.5	152.1	1.76	34.8	1459	30.0	147.0	1.25	34.7	1457	29.7	135.2	.87	34.6	1455
30.4	164.4	1.67	34.8	1459	30.5	159.6	1.77	34.8	1459	30.1	146.1	1.29	34.7	1457
30.4	168.2	1.70	34.8	1459	30.5	163.6	1.81	34.8	1459	30.2	150.2	1.40	34.7	1457
30.7	179.1	1.95	34.8	1460	30.8	175.0	2.14	34.8	1461	30.7	163.3	1.75	34.8	1459
30.7	183.2	1.96	34.8	1461	30.8	179.1	2.12	34.8	1461	30.8	167.5	1.97	34.8	1460
30.8	195.2	2.03	34.9	1461	30.7	191.3	1.99	34.8	1461	30.6	179.0	1.76	34.8	1459
30.8	199.0	2.02	34.9	1461	30.6	195.2	1.87	34.8	1460	30.6	182.5	1.91	34.8	1460
30.7	210.7	1.89	34.9	1461	30.6	207.3	1.86	34.8	1460	30.5	193.8	1.87	34.8	1460
30.7	214.5	1.92	34.8	1461	30.6	211.3	1.84	34.8	1460	30.4	198.1	1.79	34.8	1460
30.6	226.1	1.85	34.9	1461	30.6	223.1	1.83	34.8	1461	30.4	210.6	1.66	34.8	1460
30.6	229.8	1.78	34.9	1461	30.6	227.0	1.78	34.8	1460	30.4	214.3	1.66	34.8	1460
30.6	240.9	1.81	34.9	1461	30.4	238.5	1.62	34.8	1460	30.3	226.4	1.72	34.8	1460
30.6	244.7	1.80	34.9	1461	30.5	242.4	1.68	34.8	1460	30.4	230.6	1.54	34.8	1459
30.7	255.8	1.89	34.9	1461	30.4	253.6	1.63	34.8	1460	30.4	243.0	1.66	34.8	1460
30.7	259.6	1.87	34.9	1461	30.4	257.4	1.62	34.8	1460	30.4	247.1	1.60	34.8	1460
30.7	270.6	1.86	34.9	1462	30.4	268.8	1.54	34.8	1460	30.4	258.8	1.57	34.8	1460
30.6	274.3	1.81	34.9	1461	30.4	272.3	1.52	34.8	1460	30.4	262.7	1.58	34.8	1460
30.6	285.3	1.73	34.9	1461	30.3	282.5	1.47	34.8	1460	30.3	274.7	1.51	34.8	1460
30.6	288.8	1.74	34.9	1461	30.3	286.2	1.47	34.8	1460	30.3	278.7	1.48	34.8	1460
30.4	299.6	1.57	34.9	1461	30.3	297.5	1.44	34.8	1460	30.3	290.5	1.49	34.8	1460
30.4	303.2	1.56	34.9	1461	30.3	301.2	1.42	34.8	1460	30.3	294.4	1.45	34.8	1460
30.3	313.8	1.37	34.9	1460	30.2	312.1	1.31	34.8	1460	30.2	305.5	1.39	34.8	1460
30.3	317.4	1.35	34.9	1460	30.2	315.6	1.30	34.8	1460	30.2	309.1	1.35	34.8	1460
30.1	327.7	1.22	34.8	1460	30.1	326.7	1.22	34.8	1460	30.2	320.4	1.34	34.8	1460
30.1	331.2	1.16	34.8	1459	30.1	330.3	1.18	34.8	1459	30.2	324.2	1.34	34.8	1460
30.0	341.6	1.10	34.9	1459	30.0	340.4	1.08	34.8	1459	30.1	335.5	1.23	34.8	1460
30.1	345.0	1.19	34.8	1460	30.2	344.0	1.22	34.9	1460	30.2	339.0	1.24	34.8	1460
30.3	355.2	1.40	34.9	1461	30.2	355.0	1.33	34.8	1461	30.2	350.2	1.31	34.8	1460
30.3	358.6	1.35	34.9	1461	30.2	358.7	1.33	34.8	1461	30.2	353.9	1.31	34.8	1460
30.3	368.7	1.36	34.9	1461	30.3	369.4	1.36	34.8	1461	30.3	364.7	1.43	34.9	1461
30.2	372.0	1.23	34.9	1460	30.3	373.0	1.34	34.8	1461	30.4	368.2	1.44	34.8	1461
30.3	382.1	1.32	34.9	1461	30.2	383.2	1.31	34.8	1461	30.3	379.0	1.41	34.8	1461
30.3	385.4	1.39	34.9	1461	30.2	386.7	1.29	34.8	1461	30.2	382.7	1.35	34.8	1461
30.3	395.2	1.32	34.9	1461	30.2	397.1	1.29	34.8	1461	30.2	393.5	1.32	34.8	1461
30.2	398.6	1.30	34.9	1461	30.2	400.5	1.30	34.8	1461	30.2	397.1	1.29	34.8	1461
30.3	408.4	1.33	34.9	1461	30.1	410.9	1.19	34.8	1461	30.1	407.7	1.24	34.8	1461
30.2	411.6	1.25	34.9	1461	30.2	414.3	1.19	34.9	1461	30.2	411.2	1.20	34.8	1461
30.2	421.3	1.27	34.9	1461	30.2	424.6	1.25	34.8	1461	30.1	421.4	1.18	34.8	1461
30.2	424.6	1.27	34.9	1461	30.2	428.0	1.25	34.8	1461	30.2	424.8	1.20	34.8	1461
30.3	434.1	1.31	34.9	1462	30.2	437.9	1.22	34.8	1461	30.2	435.3	1.22	34.8	1461
30.3	437.1	1.31	34.9	1462	30.2	441.2	1.21	34.8	1461	30.2	438.8	1.20	34.8	1461
30.3	446.5	1.31	34.9	1462	30.2	451.2	1.21	34.8	1462	30.2	449.2	1.20	34.8	1462
30.3	449.6	1.37	34.9	1462	30.2	454.6	1.25	34.8	1462	30.3	452.5	1.20	34.8	1462
30.3	459.1	1.34	34.9	1462	30.2	464.5	1.25	34.8	1462	30.2	462.3	1.31	34.8	1462
30.3	462.1	1.28	34.9	1462	30.3	467.8	1.30	34.9	1462	30.2	465.7	1.24	34.8	1462
30.2	471.3	1.24	34.9	1462	30.3	477.4	1.30	34.9	1462	30.2	475.9	1.23	34.8	1462
30.2	474.4	1.24	34.9	1462	30.3	480.6	1.29	34.8	1462					

Cast 20G											
Cond.	Pres.	Temp.	Sal.	Snd.Spd.							
mS/cm	dbars	°C	ppt	m/s							
26.7	2.3	-1.81	33.8	1439	30.4	262.7	1.58	34.8	1460		
26.7	3.4	-1.81	33.9	1439	30.4	266.7	1.54	34.8	1460		
26.7	5.2	-1.80	33.9	1439	30.4	270.8	1.54	34.8	1460		
26.7	7.6	-1.80	33.9	1439	30.3	274.7	1.51	34.8	1460		
26.7	10.0	-1.80	33.9	1439	30.3	278.7	1.48	34.8	1460		
26.7	12.3	-1.80	33.9	1439	30.3	282.6	1.47	34.8	1460		
26.7	14.7	-1.79	33.9	1439	30.3	286.6	1.50	34.8	1460		
26.7	17.1	-1.79	33.9	1439	30.3	290.5	1.49	34.8	1460		
26.7	20.2	-1.79	33.9	1439	30.3	294.4	1.45	34.8	1460		
26.7	23.7	-1.79	33.9	1439	30.3	298.3	1.43	34.8	1460		
26.8	27.2	-1.78	34.0	1440	30.3	302.1	1.41	34.8	1460		
26.8	30.6	-1.78	34.0	1440	30.3	305.5	1.39	34.8	1460		
26.8	34.0	-1.78	34.0	1440	30.2	309.1	1.35	34.8	1460		
26.8	37.4	-1.78	34.0	1440	30.2	312.7	1.34	34.8	1460		
26.9	40.8	-1.79	34.0	1440	30.2	316.5	1.34	34.8	1460		
26.9	44.2	-1.79	34.1	1440	30.2	320.4	1.34	34.8	1460		
26.9	47.7	-1.80	34.1	1440	30.2	324.2	1.34	34.8	1460		
26.9	51.2	-1.79	34.1	1440	30.2	328.0	1.33	34.8	1460		
26.9	54.9	-1.80	34.1	1440	30.2	331.8	1.32	34.8	1460		
26.9	59.1	-1.80	34.1	1440	30.1	335.5	1.23	34.8	1460		
26.9	63.7	-1.80	34.1	1440	30.1	339.0	1.24	34.8	1460		
26.9	68.3	-1.79	34.1	1441	30.2	342.8	1.28	34.8	1460		
27.0	72.7	-1.74	34.2	1441	30.2	346.5	1.32	34.8	1460		
27.0	76.9	-1.73	34.2	1441	30.2	350.2	1.31	34.8	1460		
27.0	81.1	-1.74	34.2	1441	30.2	353.9	1.31	34.8	1460		
27.1	85.5	-1.69	34.2	1441	30.2	357.6	1.34	34.8	1461		
27.4	90.1	-1.40	34.3	1443	30.3	361.2	1.41	34.8	1461		
27.7	94.7	-0.98	34.3	1445	30.3	364.7	1.43	34.9	1461		
27.9	99.2	-0.83	34.3	1446	30.3	368.2	1.44	34.8	1461		
28.1	103.7	-0.62	34.4	1447	30.4	371.8	1.46	34.8	1461		
28.3	107.9	-0.43	34.4	1448	30.3	375.4	1.43	34.8	1461		
28.4	111.8	-0.28	34.4	1449	30.3	379.0	1.41	34.8	1461		
28.8	115.6	.13	34.5	1451	30.3	382.7	1.35	34.8	1461		
29.0	119.1	.29	34.5	1452	30.2	386.3	1.31	34.8	1461		
29.1	122.8	.36	34.5	1452	30.2	389.9	1.33	34.8	1461		
29.1	127.0	.41	34.6	1452	30.2	393.5	1.32	34.8	1461		
29.4	131.2	.67	34.6	1454	30.2	397.1	1.29	34.8	1461		
29.6	135.2	.87	34.6	1455	30.2	400.6	1.26	34.8	1461		
29.7	138.9	1.00	34.7	1455	30.2	404.1	1.25	34.8	1461		
29.9	142.4	1.14	34.7	1456	30.2	407.7	1.24	34.8	1461		
30.0	146.1	1.29	34.7	1457	30.1	411.2	1.20	34.8	1461		
30.1	150.2	1.40	34.7	1457	30.2	414.7	1.22	34.8	1461		
30.2	154.5	1.51	34.7	1458	30.1	418.0	1.18	34.8	1461		
30.4	158.9	1.66	34.7	1459	30.1	421.4	1.18	34.8	1461		
30.5	163.3	1.75	34.8	1459	30.1	424.8	1.20	34.8	1461		
30.7	167.5	1.97	34.8	1460	30.2	428.4	1.23	34.8	1461		
30.8	171.5	2.07	34.8	1461	30.2	431.8	1.24	34.8	1461		
30.6	175.4	1.86	34.8	1460	30.2	435.3	1.22	34.8	1461		
30.5	179.0	1.76	34.8	1459	30.2	438.8	1.20	34.8	1461		
30.6	182.5	1.91	34.8	1460	30.2	442.3	1.21	34.8	1461		
30.6	186.0	1.86	34.8	1460	30.2	445.8	1.21	34.8	1462		
30.6	189.7	1.85	34.8	1460	30.2	449.2	1.20	34.8	1462		
30.6	193.8	1.87	34.8	1460	30.2	452.5	1.20	34.8	1462		
30.5	198.1	1.79	34.8	1460	30.3	455.8	1.32	34.9	1462		
30.4	202.4	1.63	34.8	1459	30.3	459.0	1.33	34.9	1462		
30.4	206.6	1.66	34.8	1460	30.3	462.3	1.31	34.8	1462		
30.4	210.6	1.66	34.8	1460	30.2	465.7	1.24	34.8	1462		
30.4	214.3	1.66	34.8	1460	30.2	469.1	1.25	34.9	1462		
30.4	218.1	1.64	34.8	1460	30.2	472.5	1.25	34.8	1462		
30.4	222.2	1.62	34.8	1460	30.2	475.9	1.23	34.8	1462		
30.5	226.4	1.72	34.8	1460	30.2	479.3	1.21	34.8	1462		
30.3	230.6	1.54	34.8	1459							
30.4	234.8	1.58	34.8	1460							
30.4	238.9	1.60	34.8	1460							
30.5	243.0	1.66	34.8	1460							
30.4	247.1	1.60	34.8	1460							
30.4	251.2	1.57	34.8	1460							
30.4	255.1	1.57	34.8	1460							
30.4	258.8	1.57	34.8	1460							

# **Appendix E**

## **XBT Tabulations**

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*Map of XBT stations during transit into the ice pack, May 7-9. The depth of the Polar Front is given in parenthesis.*



XBT #1 (T-4)		XBT #5 (T-7)				XBT #6 (T-7)				XBT #7 (T-7)			
DATE: 5/5/88		Date: 5/7/1988				DATE: 5/7/88				DATE: 5/7/88			
TIME: 2255Z		0310Z				TIME: 0445Z				TIME: 0700Z			
LAT: 78 48 0N		77 13 6 N				LAT: 77 41 47N				LAT: 78 06 5N			
LONG: 02 00 0W		2 36 2 E				LONG: 2 14 66E				LONG: 4 06 5E			
Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth
(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)
-0.84	2.6	-1.06	2.6	-0.41	320.7	-0.21	1.3	-0.81	655.7	0.52	1.3	0.41	451.1
-1.06	3.9	-1.14	3.9	-0.41	333.8	-0.89	3.9	-0.8	668.4	0.06	2.6	0.34	464
-1.13	5.2	-1.16	6.5	-0.43	346.9	-0.78	10.3	-0.81	693.6	0.01	3.9	0.27	476.9
1.17	9.1	-0.99	7.8	-0.43	360	-0.68	15.5	-0.84	706.1	0.02	5.2	0.19	489.8
-1.11	11.6	-1.06	9.1	-0.41	373.1	-0.39	20.7	-0.83	718.7	-0.02	6.5	0.17	502.7
-1.08	15.5	-1.33	10.3	-0.43	386.1	0.13	24.6	-0.86	731.2	-0.07	10.3	0.15	515.6
-1.04	19.4	-1.24	11.6	-0.43	399.2	0.76	34.9	-0.85	743.7	0.38	11.6	0.13	528.4
-0.91	27.1	-1.18	12.9	-0.43	412.2	0.48	40	-0.85	756.2	0.88	14.2	0.1	541.2
-0.49	40.7	-1.09	14.2	-0.41	425.2	0.05	50.4			0.94	15.5	0.04	554
-0.27	54.2	-0.34	23.3	-0.4	438.1	-0.02	59.4			0.78	16.8	0.05	566.8
-0.38	67.7	-0.32	27.1	-0.42	451.1	-0.07	67.7			0.95	18.1	0.06	579.6
-0.37	81.2	-0.36	31	-0.42	464	-0.19	81.2			0.69	19.4	0.06	592.3
0.36	94.7	-0.39	38.8	-0.42	476.9	-0.27	94.7			0.74	20.7	0.03	605
-0.37	108.1	-0.27	42.6	-0.43	489.8	-0.34	108.1			1	22	-0.03	617.7
-0.38	121.5	-0.06	46.5	-0.45	502.7	-0.38	121.5			1.47	23.3	-0.13	630.4
-0.38	135	0.18	50.4	-0.45	515.6	-0.42	135			1.2	24.6	-0.14	643.1
-0.41	148.4	0.21	52.9	-0.48	528.4	-0.45	148.4			0.9	25.9	-0.18	655.7
-0.41	161.7	0.19	54.2	-0.51	541.2	-0.43	161.7			0.87	27.1	-0.2	668.4
-0.39	175.1	0.01	58.1	-0.53	554	-0.53	175.1			1.05	28.4	-0.21	681
0.39	188.4	0.03	61.9	-0.53	556.8	-0.5	188.4			1.26	31	-0.24	693.6
-0.4	201.7	-0.1	67.7	-0.54	579.6	-0.54	201.7			1.47	33.6	-0.28	706.1
-0.37	215	-0.13	73.5	-0.55	592.3	-0.5	215			1.76	36.2	-0.29	718.7
-0.36	228.3	-0.14	81.2	-0.55	605	0.54	228.3			1.91	38.8	-0.3	731.2
-0.34	241.6	-0.21	94.7	-0.57	617.7	-0.6	241.6			1.49	41.3	-0.31	743.7
-0.38	254.8	-0.24	108.1	-0.58	630.4	-0.56	254.8			1.23	45.2	-0.31	756.2
-0.4	268	-0.21	121.5	-0.58	643.1	-0.57	268			1.12	52.9		
0.39	281.2	-0.25	135	-0.6	655.7	-0.52	281.2			1.22	56.8		
-0.41	294.4	-0.24	148.4	-0.58	668.4	-0.56	294.4			1.08	60.6		
-0.41	307.6	-0.26	161.7	-0.61	681	-0.63	307.6			1.74	67.1		
-0.46	320.7	-0.24	175.1	-0.61	693.6	-0.66	320.7			1.22	82.5		
-0.44	333.8	-0.29	188.4	-0.63	706.1	-0.67	333.8			1.34	92.7		
-0.44	346.9	-0.33	201.7	-0.63	718.7	-0.68	346.9			1.5	100.4		
-0.43	360	-0.41	215	-0.63	731.2	-0.68	346.9			1.51	108.1		
-0.49	373.1	-0.41	228.3	-0.63	743.7	-0.73	360			1.48	121.5		
-0.48	386.1	-0.41	241.6	-0.62	756.2	-0.75	373.1			1.36	135		
-0.5	399.2	-0.43	254.8			-0.77	386.1			1.39	148.4		
-0.51	425.2	-0.43	268			-0.74	399.2			1.35	161.7		
-0.52	438.1	-0.42	281.2			-0.71	412.2			1.45	175.1		
-0.5	451.1	-0.42	294.4			-0.86	425.2			1.45	188.4		
		-0.42	307.6			-0.88	438.1			1.32	201.7		
						-0.89	451.1			1.16	215		
						-0.89	464			1.14	228.3		
						-0.89	476.9			1.14	241.6		
						-0.88	489.8			1.07	254.8		
						-0.88	502.7			1.03	268		
						-0.88	515.6			0.99	281.2		
						-0.87	528.4			0.97	294.4		
						-0.86	541.2			0.91	307.6		
						-0.86	554			0.92	320.7		
						-0.83	556.8			0.88	333.8		
						-0.81	579.6			0.85	346.9		
						-0.85	592.3			0.79	360		
						-0.84	605			0.71	373.1		
						-0.84	617.7			0.67	386.1		
						0.84	630.4			0.62	399.2		
						-0.83	643.1			0.58	412.3		
										0.52	425.2		

XBT #8 (T-7)				XBT#9 (T-7)				XBT #10				XBT #11 (T-7)	
DATE: 5/7/88				DATE: 5/7/88				DATE: 5/7/88				DATE: 5/7/88	
TIME: 0845Z				TIME: 1050Z				TIME: 1325Z				TIME: 1445Z	
LAT: 78 28.2 N				LAT: 78 31.1 N				LAT: 78 47.2 N				LAT: 78 56.9 N	
LONG: 4 39.6 E				LONG: 4 06.4 E				LONG: 2 47.99 E				LONG: 2 03.5 E	
Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth
(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)
0.36	1.3	1.03	215	-0.67	1.3	0.45	605	0.31	1.3	0.03	643.1	0.3	1.3
-0.08	2.6	1.43	218.8	-1.43	2.6	0.43	617.7	-0.46	2.6	-0.04	655.7	-1.11	2.6
-0.09	3.9	1.08	222.6	-1.58	5.2	0.39	630.4	-0.6	3.9	-0.03	668.4	-1.31	3.9
-0.11	5.2	0.99	226.4	-1.52	7.8	0.33	643.1	-0.67	5.2	-0.14	681	-1.35	5.2
0.11	10.3	1.16	228.3	-1.54	9.1	0.28	655.7	-0.64	6.5	-0.17	693.6	-1.36	7.8
-0.13	11.6	1.13	230.2	-1.53	10.3	0.18	668.4	-0.65	7.8	-0.18	706.1	-1	9.1
-0.13	14.2	0.86	241.6	-1.57	11.6	0.13	681	-0.69	9.1	-0.24	718.7	-0.87	10.3
-0.17	18.1	0.77	254	-1.76	19.4	0.09	693.6	-0.67	10.3	-0.29	731.2	-0.86	11.6
0.11	19.4	0.66	268	-1.76	22	0.05	706.1	-0.44	15.5	-0.3	743.7	-0.76	15.5
1.06	20.7	0.54	281.2	-1.75	25.9	0.03	718.7	0.06	20.7	-0.38	756.2	-0.88	19.4
1.11	22	0.48	294.4	-1.66	31	0.02	731.2	0.17	25.9			-0.98	27.1
1.04	23.3	0.42	307.6	-1.66	32.3	0.02	743.7	0.18	27.1			-0.99	28.4
0.51	28.4	0.4	320.7	-1.57	36.2	-0.06	756.2	0.25	29.7			-1.03	29.7
1.2	32.3	0.33	333.8	1.61	40			0.31	34.9			-1.22	40.7
1.16	33.6	0.28	346.9	1.5	45.2			0.47	40			1.23	41.3
1.11	34.9	0.27	360	1.32	50.4			1.27	54.2			-1.23	42.6
0.95	36.2	0.25	373.1	-0.89	54.2			1.74	67.7			-1.17	45.2
0.86	37.5	0.22	386.1	0.73	67.7			1.85	81.2			-1.17	46.5
0.94	38.8	0.17	399.2	1.49	81.2			1.86	94.7			-1.15	49.1
1.65	40.7	0.14	412.2	1.81	94.7			1.86	108.1			-1.06	50.4
1.54	41.3	0.11	425.2	1.74	108.7			1.8	121.5			-0.96	51.6
1	43.9	0.09	438.1	1.7	121.5			1.67	135			-0.88	54.2
0.51	49.1	0.06	451.1	1.69	135			1.62	148.4			-0.51	67.7
0.48	50.4	0.06	464	1.69	148.4			1.55	161.7			0.25	81.2
0.51	51.6	0.04	476.9	1.61	161.7			1.62	175.1			0.47	94.7
0.4	54.2	-0.04	489.8	1.58	175.1			1.55	188.4			0.45	95.6
0.38	55.5	-0.06	502.7	1.51	188.4			1.26	201.7			0.47	100.4
0.44	60.6	-0.1	515.6	1.47	201.7			1.25	215			0.45	104.3
0.59	63.8	-0.09	528.4	1.51	215			1.11	228.3			0.38	108.1
0.96	67.1	-0.15	541.2	1.41	228.3			0.82	241.6			0.45	112
0.82	67.7	-0.17	554	1.29	241.6			0.94	254.8			0.55	115.8
0.51	73.5	-0.17	566.8	1.23	254.8			1.1	268			0.54	119.6
0.59	81.2	-0.2	579.6	1.2	268			1.07	281.2			0.68	121.5
0.8	90.2	-0.2	592.3	1.21	281.2			0.99	294.4			0.75	123.5
0.79	91.5	0.21	605	1.21	294.4			1.03	307.6			0.94	135
0.83	92.7	-0.26	617.7	1.25	307.6			1.05	320.7			0.92	146.4
1.14	99.2	-0.28	630.4	1.24	320.7			1.06	333.8			0.94	149.4
0.87	106.8	-0.27	643.1	1.2	333.8			0.99	360			0.63	154.1
0.92	108.1	-0.29	655.7	1.18	356.9			0.95	373.1			0.67	157.9
1.08	110.7	-0.29	668.4	1.15	360			0.85	386.1			0.67	161.7
1.12	112	-0.31	681	1.11	373.1			0.8	399.2			0.86	175.1
1.1	113.2	-0.32	693.6	1.07	386.1			0.84	412.2			0.93	177
0.99	119.6	-0.33	706.1	0.9	399.2			0.72	425.2			1.03	180.8
1	121.5	-0.34	718.7	0.8	412.2			0.58	451.1			1.04	184.6
1.07	123.5	-0.38	731.2	0.72	425.2			0.6	464			0.96	188.4
1.06	124.7	-0.38	743.7	0.74	438.1			0.51	476.9			0.94	192.8
1.11	126	-0.38	756.2	0.73	451.1			0.48	489.8			1.01	201.7
1.05	132.4			0.83	464			0.4	502.7			0.99	215
1.06	135			0.81	476.9			0.41	516.6			0.99	228.3
1.21	138.8			0.74	489.8			0.4	528.4			0.99	241.6
1.21	142.6			0.72	502.7			0.39	541.2			0.98	254.8
1.3	143.9			0.73	515.6			0.23	554			0.93	268
1.36	146.4			0.7	528.4			0.22	566.8			0.88	281.2
1.11	148.4			0.61	541.2			0.16	579.6			0.85	294.4
1.04	161.7			0.53	554			0.15	592.3			0.84	307.6
0.87	175.1			0.52	566.8			0.1	605			0.8	320.7
0.8	188.4			0.43	579.6			0.09	617.7			0.79	333.8

XBT #11				XBT #13		XBT #17			
DATE: 5/7/88				DATE: 5/7/88		DATE: 5/9/88			
TIME: 1445Z				TIME: 1930Z		TIME: 1300Z			
LAT: 78 56.9 N				LAT: 78 58.2 N		LAT: 79 30.9 N			
LONG: 2 03.5 E				LONG: 1 14.85 E		LONG: 1 06.1 W			
Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth	Temp	Depth
(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)	(°C)	(M)
0.3	1.3	0.72	360	-0.64	1.3	-1.23	1.3	1.48	373.1
-1.11	2.6	0.79	373.1	-1.55	2.6	-1.71	2.6	1.36	386.1
-1.31	3.9	0.79	386.1	-1.7	5.2	-1.76	3.9	1.34	399.2
-1.35	5.2	0.75	399.2	-1.75	6.5	-1.77	5.2	1.29	412.3
-1.36	7.8	0.75	412.2	-1.66	9.1	-1.77	6.5	1.3	438.1
-1	9.1	0.69	425.2	-1.69	10.3	-1.8	7.8	1.37	451.1
-0.87	10.3	0.66	438.1	-1.67	12.9	-1.79	10.3		
-0.86	11.6	0.64	451.1	-1.69	14.2	-1.79	12.9		
-0.76	15.5	0.54	464	-1.69	18.1	-1.8	16.8		
-0.88	19.4	0.43	476.9	-1.7	19.4	-1.24	20.7		
-0.98	27.1	0.42	489.8	-1.68	20.7	-1.14	22		
-0.99	28.4	0.27	502.7	-1.69	22	-1.14	24.6		
-1.03	29.7	0.23	515.6	-1.69	25.9	-1.16	25.9		
-1.22	40.7	0.19	528.4	-1.66	28.4	-1.2	27.1		
-1.23	41.3	0.23	541.2	-1.68	29.7	-1.42	40.7		
-1.23	42.6	0.15	554	-1.69	13.6	-1.51	54.2		
-1.17	45.2	0.18	566.8	-1.66	27.1	-1.55	67.7		
-1.17	46.5	0.16	579.6	-1.71	40.7	-1.57	81.2		
-1.15	49.1	0.11	592.3	-1.3	54.2	-1.53	94.7		
-1.06	50.4	0.11	605	1.16	67.7	-0.95	108.1		
-0.96	51.6	0.09	617.7	1.97	81.2	0.08	121.5		
-0.88	54.2	0.06	630.4	1.99	94.7	0.84	135		
-0.51	67.7	0.05	643.1	1.94	108.1	1.5	148.4		
0.25	81.2	0.05	655.7	1.87	121.5	1.54	150.3		
0.47	94.7	-0.03	668.4	1.82	135	1.66	161.7		
0.45	96.6	-0.05	681	1.69	148.2	1.81	175.1		
0.47	100.4	-0.04	693.6	1.6	161.7	1.84	180.8		
0.45	104.3	-0.06	706.1	1.42	175.1	1.86	188.4		
0.38	108.1	-0.08	718.7	1.44	188.4	1.7	201.7		
0.45	112	-0.09	731.2	1.37	201.7	1.58	207.4		
0.55	115.8	-0.15	743.7	1.47	215	1.57	215		
0.54	119.6	-0.17	756.2	1.42	228.3	1.6	222.6		
0.68	121.5			1.34	241.6	1.73	226.4		
0.75	123.5			1.22	254.8	1.74	228.3		
0.94	135			1.24	268	1.74	230.2		
0.92	146.4			1.25	281.2	1.68	234		
0.94	148.4			1.23	294.4	1.6	237.8		
0.68	154.1			1.21	307.6	1.65	241.6		
0.67	157.9			1.22	320.7	1.65	249.1		
0.67	161.7			1.19	333.8	1.65	254.8		
0.86	175.1			1.18	346.9	1.6	260.5		
0.93	177			1.16	360	1.64	264.2		
1.03	180.8			1.13	373.1	1.64	268		
1.04	184.6			1.12	386.1	1.64	271.8		
0.96	188.4			1.12	399.2	1.56	279.3		
0.94	192.8			1.21	412.2	1.59	281.2		
1.01	201.7			1.23	425.2	1.63	283.1		
0.99	215			1.13	438.1	2.04	286.9		
0.99	228.3			1.2	451.1	2.06	290.6		
0.99	241.6					1.89	294.4		
0.98	254.8					1.8	301.9		
0.93	268					1.84	307.6		
0.88	281.2					1.84	309.4		
0.85	294.4					1.7	320.7		
0.84	307.6					1.76	333.8		
0.8	320.7					1.7	343.2		
0.79	333.8					1.7	346.9		

## **Appendix F**

### **S4 Current Meter Tabulations**

---

Cast 1

DEPTH			
AVG	StDev	min	max
3.9	3	2.9	4.9
8.8		8.8	8.8
14.7		14.7	14.7
17.1	.7	16.6	17.6
25.4		25.4	25.4
33.2		33.2	33.2
36.2		36.2	36.2
46.9		46.9	46.9
54.7		54.7	54.7
67.4		67.4	67.4
76.2		76.2	76.2
89.9		89.9	89.9
100.7		100.7	100.7
114.4		114.4	114.4
123.2		123.2	123.2
142.7	1.4	141.7	143.7
155.4		155.4	155.4

SPEED			
AVG	StDev	min	max
12.7	4.9	4.3	20.7
24.1		24.1	24.1
2.8		2.8	2.8
9.5	.7	9.0	10.0
8.0		8.0	8.0
5.1		5.1	5.1
4.6		4.6	4.6
5.0		5.0	5.0
3.4		3.4	3.4
5.5		5.5	5.5
.7		.7	.7
6.8		6.8	6.8
4.4		4.4	4.4
5.2		5.2	5.2
3.0		3.0	3.0
4.5	2.3	2.8	6.1
4.6		4.6	4.6

DIRECTION			
AVG	StDev	min	max
190.1	94.2	18.6	347.5
41.0		41.0	41.0
159.0		159.0	159.0
220.7	64.8	174.9	266.6
191.6		191.6	191.6
339.4		339.4	339.4
254.7		254.7	254.7
276.8		276.8	276.8
273.4		273.4	273.4
349.5		349.5	349.5
213.7		213.7	213.7
355.0		355.0	355.0
344.1		344.1	344.1
313.5		313.5	313.5
0		0	0
338.8	24.2	321.6	355.9
325.6		325.6	325.6

Cast 2

DEPTH			
AVG	StDev	min	max
8.8	0	8.8	8.8
12.1	1.2	10.8	13.7
18.6	1.4	17.6	19.6
26.9	2.1	25.4	28.3
32.7	2.1	31.3	34.2
41.5	2.1	40.1	43.0
47.9	1.4	46.9	48.9
52.8	1.4	51.8	53.8
58.7	1.4	57.7	59.6
67.4	2.8	65.5	69.4
75.3	0	75.3	75.3
80.6	.7	80.2	81.1
86.7	2.0	85.0	89.0
91.9	1.4	90.9	92.9
97.3	.7	96.8	97.8
102.2	.7	101.7	102.6
107.5	1.4	106.5	108.5
113.1	2.3	110.5	114.4
118.8	.7	118.3	119.3
123.2	1.4	122.2	124.1
131.3	2.3	130.0	133.9
136.9	1.4	135.9	137.8
141.3	.7	140.8	141.7
147.0	1.5	145.7	148.6
152.0	.7	151.5	152.5
156.9	.7	156.4	157.4
162.3	2.0	160.3	164.2
168.1	0	168.1	168.1
173.0	0	173.0	173.0
177.9	1.4	176.9	178.9
182.3	2.1	180.8	183.8
187.7	1.4	186.7	188.7
192.1	2.1	190.6	193.5
197.0	2.1	195.5	198.4
202.7	2.0	200.4	204.3
212.1	2.8	210.2	214.1
222.4	2.1	220.9	223.9
227.3	2.1	225.8	228.7
233.1	2.1	231.7	234.6
238.0	2.1	236.6	239.5
248.8	.7	248.3	249.3
254.2	0	254.2	254.2
267.8	1.4	266.9	268.8
273.2	2.1	271.7	274.7
284.0	.7	283.5	284.5
291.8	2.1	290.3	293.3
303.0	0	303.0	303.0
307.9	1.2	306.0	308.9

SPEED			
AVG	StDev	min	max
13.7	6.0	8.7	26.4
8.1	4.1	3.9	15.0
13.3	.1	13.2	13.4
16.2	.6	15.8	16.6
16.8	.2	16.7	16.9
19.1	1.3	18.2	20.0
19.4	2.3	17.8	21.0
21.1	5.6	17.1	25.1
24.3	9.5	17.6	31.0
24.8	10.9	17.1	32.5
26.0	12.2	17.4	34.6
25.9	11.9	17.5	34.4
30.0	10.5	18.0	36.8
27.0	14.1	17.0	36.9
27.5	13.6	17.9	37.1
27.6	15.6	16.6	38.7
27.5	15.5	16.5	38.5
31.0	12.1	17.0	38.7
28.0	14.6	17.7	38.4
28.9	12.8	19.9	38.0
32.1	10.4	20.2	38.8
28.2	12.8	19.2	37.3
28.2	13.0	19.0	37.4
30.9	10.6	18.7	37.1
27.2	13.3	17.8	36.6
26.5	12.7	17.5	35.5
28.9	10.7	16.5	35.5
24.5	11.9	16.0	32.9
23.6	11.1	15.8	31.5
23.3	11.6	15.1	31.4
22.7	10.7	15.1	30.2
23.1	11.2	15.2	31.0
22.7	12.4	13.9	31.4
21.8	12.0	13.4	30.3
24.1	9.1	13.7	30.0
21.2	10.5	13.7	28.6
20.9	9.7	14.0	27.7
21.1	9.5	14.4	27.8
20.8	8.7	14.7	26.9
20.2	9.2	13.7	26.7
18.5	7.0	13.5	23.4
17.2	6.1	12.9	21.6
16.3	5.9	12.1	20.4
16.1	5.2	12.4	19.7
15.4	3.8	12.7	18.1
13.9	2.7	12.0	15.8
12.2	2.2	10.6	13.8
12.0	1.0	10.7	13.2

DIRECTION			
AVG	StDev	min	max
113.1	107.5	14.6	342.8
235.8	141.5	9.2	355.6
186.2	222.4	28.9	343.5
28.6	28.1	8.7	48.4
49.7	14.2	39.7	59.7
66.3	1.5	65.2	67.4
70.6	2.5	68.8	72.4
71.0	2.9	69.0	73.0
70.6	6.0	66.4	74.9
68.7	3.2	66.4	70.9
70.5	.1	70.4	70.5
69.4	.2	69.3	69.6
70.4	1.1	69.1	71.2
71.2	1.6	70.1	72.3
75.6	1.2	74.7	76.4
77.3	1.1	76.5	78.1
81.5	3.2	79.2	83.7
82.9	2.7	80.8	86.0
81.2	4.2	78.3	84.2
83.3	2.1	81.8	84.8
84.2	4.4	80.2	88.9
79.3	4.2	76.3	82.2
78.6	4.1	75.7	81.5
76.3	3.4	74.0	80.1
75.4	.4	75.1	75.7
74.3	.4	74.1	74.6
73.7	.8	73.1	74.6
68.9	2.3	67.3	70.5
70.0	0	70.0	70.0
69.8	2.3	68.2	71.4
72.5	3.6	69.9	75.0
73.7	4.1	70.9	76.6
70.9	.9	70.3	71.6
71.5	2.8	69.5	73.5
70.9	3.5	67.9	74.7
68.3	4.3	65.2	71.3
67.2	4.0	64.4	70.0
68.6	3.9	65.8	71.3
67.3	7.4	62.1	72.6
68.2	4.3	65.2	71.3
71.4	9.4	64.7	78.0
70.8	9.4	64.1	77.5
68.0	12.2	59.4	76.7
65.6	13.4	56.1	75.1
67.2	9.0	60.9	73.6
63.2	7.5	57.9	68.6
57.3	10.0	50.3	64.4
55.1	5.7	48.1	61.2

# **S4 TIME SERIES**

**MAY 15-21, 1988**

Date/Time	Spd (cm/s)	Dir (deg)
05/15/88 15:51	12.448	43.7
05/15/88 16:39	11.759	41.6
05/15/88 17:27	21.213	45
05/15/88 18:15	30.28	53.1
05/15/88 19:03	34.755	60.3
05/15/88 19:51	33.833	65.6
05/15/88 20:39	36.177	72
05/15/88 21:27	32.715	78
05/15/88 22:15	28.862	76
05/15/88 23:03	23.854	69.9
05/15/88 23:51	24.865	63.2
05/16/88 00:39	24.692	54.9
05/16/88 01:27	28.792	57.2
05/16/88 02:15	30.059	62.2
05/16/88 03:03	31.305	63.4
05/16/88 03:51	33.899	63.7
05/16/88 04:39	39.347	58.1
05/16/88 05:27	42.506	57.9
05/16/88 06:15	45.874	56.4
05/16/88 07:03	40.339	54.9
05/16/88 07:51	39.262	67.2
05/16/88 08:39	35.956	69.1
05/16/88 09:27	33.669	66.2
05/16/88 10:15	33.474	69.7
05/16/88 11:03	28.218	73.1
05/16/88 11:51	19.945	74.3
05/16/88 12:39	21.508	59.9
05/16/88 13:27	22.365	51.9
05/16/88 14:15	29.969	54.5
05/16/88 15:03	33.338	56.5
05/16/88 15:51	37.593	58.9
05/16/88 16:39	36.249	61.3
05/16/88 17:27	37.032	69.1
05/16/88 18:15	39.517	68.6
05/16/88 19:03	42.454	77.2
05/16/88 19:51	37.508	82.6
05/16/88 20:39	30.865	71.1
05/16/88 21:27	28.265	64
05/16/88 22:15	28.206	66.2
05/16/88 23:03	26.195	69.9
05/16/88 23:51	32.111	63
05/17/88 00:39	36.598	65.1
05/17/88 01:27	30.592	62.8
05/17/88 02:15	28.961	57.4
05/17/88 03:03	30.925	52.1
05/17/88 03:51	31.735	51.4
05/17/88 04:39	30.067	49.3
05/17/88 05:27	26.555	50.2
05/17/88 06:15	27	53.1
05/17/88 07:03	22.74	50.7
05/17/88 07:51	28.454	42.4
05/17/88 08:39	29.302	42.5
05/17/88 09:27	32.811	44.5
05/17/88 10:15	32.255	43.5
05/17/88 11:03	29.961	50.1
05/17/88 11:51	28.037	47.9
05/17/88 12:39	27.247	49.8
05/17/88 13:27	32.193	49.3
05/17/88 14:15	31.459	55.1
05/17/88 15:03	30.232	55.8
05/17/88 15:51	29.178	56.7
05/17/88 16:39	19.28	53
05/17/88 17:27	18.439	65.7
05/17/88 18:15	19.539	67.1
05/17/88 19:03	17.127	47.4
05/17/88 19:51	19.118	48
05/17/88 20:39	16.322	54
05/17/88 21:27	20.251	55.1
05/17/88 22:15	22.922	60.8

Date/Time	Spd (cm/s)	Dir (deg)
05/20/88 08:39	10.018	177
05/20/88 09:27	7.0711	188
05/20/88 10:15	5.4037	182
05/20/88 11:03	3.3106	115
05/20/88 11:51	10.249	84.4
05/20/88 12:39	12.419	75.1
05/20/88 13:27	16.162	77.9
05/20/88 14:15	27.412	97.1
05/20/88 15:03	30.915	98.2
05/20/88 15:51	25.115	107
05/20/88 16:39	29.225	120
05/20/88 17:27	28.923	126
05/20/88 18:15	34.8	136
05/20/88 19:03	26.531	130
05/20/88 19:51	14.047	118
05/20/88 20:39	7.8409	84.1
05/20/88 21:27	5.2802	52.7
05/20/88 22:15	6.7201	53.5
05/20/88 23:03	10.765	54.8
05/20/88 23:51	17.939	59.1
05/21/88 00:39	26.63	72.5
05/21/88 01:27	20.138	74.4
05/21/88 02:15	27.268	77.3
05/21/88 03:03	22.814	88

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<b>1. Agency Use Only (Leave blank).</b>		<b>2. Report Date.</b> August 1989	<b>3. Report Type and Dates Covered.</b>	
<b>4. Title and Subtitle.</b> Environmental Measurements and Analysis: Arctic Acoustics Experiments in the Marginal Ice Zone			<b>5. Funding Numbers.</b>  Program Element No. 62435N  Project No. RJ035  Task No.  Accession No. DN496433	
<b>6. Author(s).</b>  Roger W. Meredith, Paul J. Bucca, and *Kim McCoy			<b>8. Performing Organization Report Number.</b>  NORDA Report 210	
<b>7. Performing Organization Name(s) and Address(es).</b>  Ocean Acoustics and Technology Directorate Naval Ocean Research and Development Activity Stennis Space Center, Mississippi 39529-5004			<b>10. Sponsoring/Monitoring Agency Report Number.</b>	
<b>9. Sponsoring/Monitoring Agency Name(s) and Address(es).</b>  Office of Naval Technology 800 N. Quincy Street Arlington, VA 22217-5000				
<b>11. Supplementary Notes.</b>  *Ocean Sensors, Inc., Encinitas, California 92024				
<b>12a. Distribution/Availability Statement.</b>  Approved for public release; distribution is unlimited. Naval Ocean Research and Development Activity, Stennis Space Center, Mississippi 39529-5004.			<b>12b. Distribution Code.</b>	
<b>13. Abstract (Maximum 200 words).</b>  From 27 April through 28 May 1988, personnel of the Naval Ocean Research and Development Activity and other institutions utilized the USCGC <i>Northwind</i> to establish an ice camp to conduct an environmental acoustics exercise in the Marginal Ice Zone (MIZ) between Greenland and Svalbard in the Fram Strait. This report documents the comprehensive set of environmental data collected in support of the acoustic measurements. These data include expendable bathythermographs, conductivity-temperature-depth profiles, both vertical and time series current meter casts, meteorological and navigational measurements, and satellite imagery. In addition, this report provides a brief synopsis of the sequence of events that transpired during the exercise, a preliminary environmental analysis, and some suggestions for future MIZ experiments.				
<b>14. Subject Terms.</b>  oceanography, Marginal Ice Zone, MIZ, ICEX-88			<b>15. Number of Pages.</b> 70	
			<b>16. Price Code.</b>	
<b>17. Security Classification of Report.</b>  Unclassified	<b>18. Security Classification of This Page.</b>  Unclassified	<b>19. Security Classification of Abstract.</b>  Unclassified	<b>20. Limitation of Abstract.</b>  None	